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MAGAZINE

AUGUST 1991

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 10 NUMBER 14

GRAPHICS

OCR and Graphics,
Too: HP's \$1,590
Gray-Scale Scanner
Leads the Pack

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Microsoft's Visual
BASIC: Brilliant
Breakthrough or Just
Another Pretty Face?

SOFTWARE

One-Stop Computing:
Nine Integrated
Packages Do It All
For Under \$200

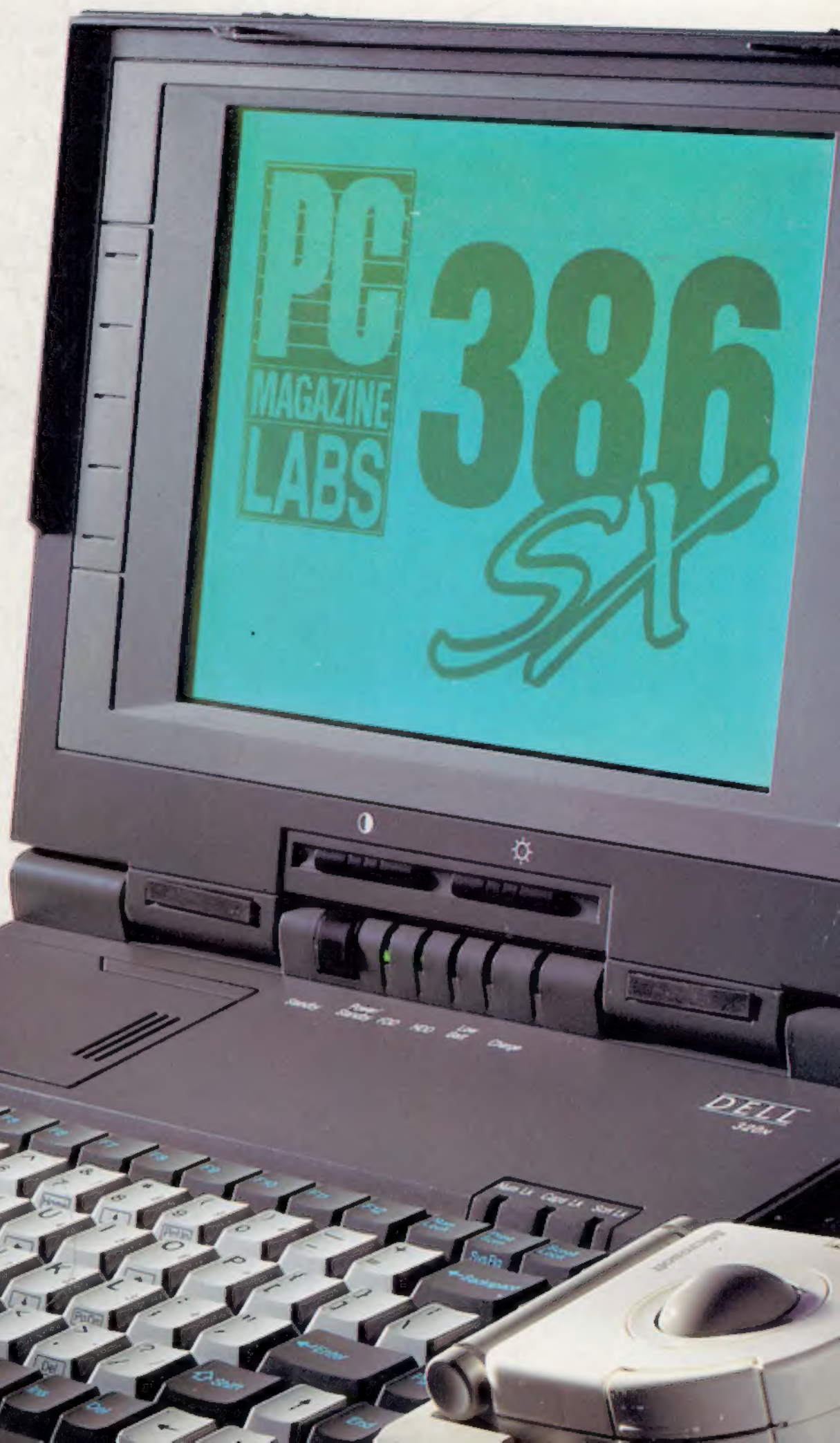
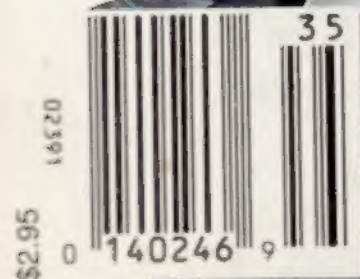
FREE UTILITY

Bored with Windows'
Colors? Paint It
Your Way with
WINCOLOR.EXE

Desktop Power, Notebook Size

PC Labs Tests 27
386SX Notebooks

- Super Storage:
Up to 60MB!
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Who's Got It Right?
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wanted.

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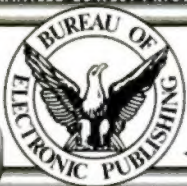
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CIRCLE 180 ON READER SERVICE CARD

Inside

The bellhops can't quite figure out what's going on: Last night, 30 *PC Magazine* editors checked into the hotel and began rearranging the furniture in their rooms and unraveling power strips.

Now it's barely 8:00 A.M., and dozens of people are flooding the hotel's entrance lugging monitors, computers, and software boxes. There aren't enough bellhops to go around; another Editors' Day is about to begin.

Eight times a year, some two dozen *PC Magazine* editors get up from behind their desks and fly off in search of the hottest new hardware and software technology.

Since the first Editors' Day, which took place in Dallas over five years ago, the event has evolved into an extremely

effective tool both for editors, who need to stay on top of a constantly growing industry, and for vendors, whose complex products require more than a simple explanation.

This is especially true for smaller vendors who have to sink all their dollars into R & D rather than press tours to New York and who wouldn't otherwise get a chance to explain how their products work.

At an Editors' Day, *PC Magazine's* editors break into eight to ten teams, and each team sees eight private product demonstrations from vendors in the geographic region. No matter how



big or small it is, each participating vendor gets a chance to show what's new, what's improved, and what's to come in the future. Editors ask questions about the technology and quiz the vendors on their specific markets and the trends they're seeing.

When the private demos end, everyone is invited to the ballroom for *PC Magazine's* own 2-hour mini trade show. There, all the vendors who participated in the Editors' Day, as well as

those who didn't have a private appointment, set up their products for everyone to examine.

This dynamic event, which features aisles as crowded as those at Comdex, presents a fascinating snapshot of a region's high-tech community. At the largest Editors' Day of the year (in Silicon Valley, natu-



PC Labs director Jim Galley and staff editor Tom Unger examine the Tangent 320N (reviewed in this issue) at a recent Editors' Day.

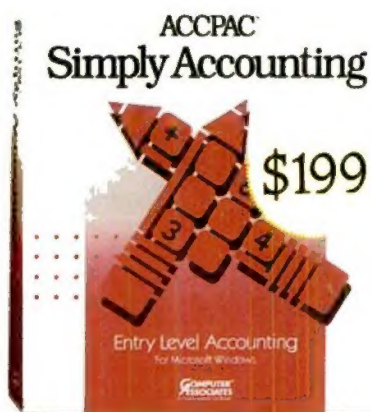
rally), up to 400 participants come together to exchange ideas.

Finally, 11 hours after the first demonstrations, all the computers, monitors, and software go back into their boxes, and once again it's a mad scramble to recruit enough bellhops to help out. Meanwhile, the editors stagger back to their rooms with armloads of notes and press kits to study.

The following day, the editors head to the airport, the hotel returns to normal, and everyone involved looks back and remembers just how valuable Editors' Day was. Especially the bellhops. —Don Willmott

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It tells you how you can run Lotus 1-2-3, dBASE and other favorite MS-DOS programs on a Macintosh.

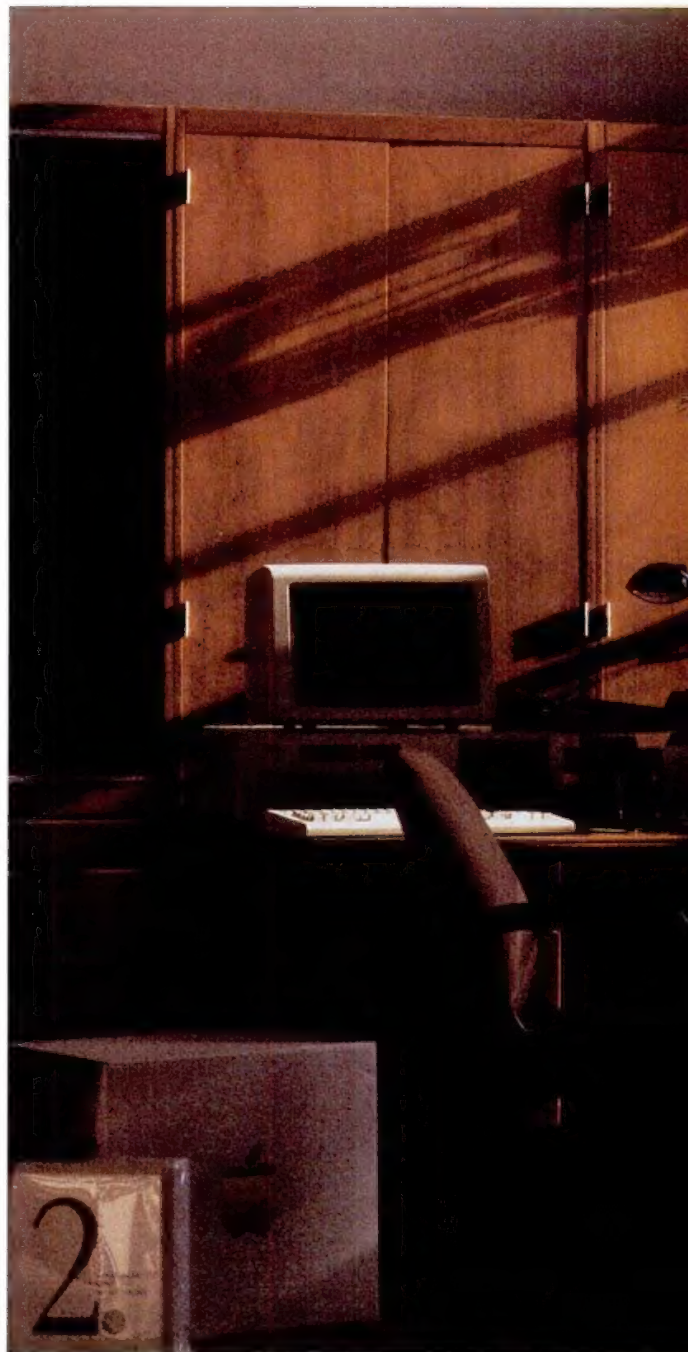
How you can easily move information back and forth between Macintosh and your MS-DOS PCs on a standard 3 1/2" floppy disk.

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You'll also discover that Macintosh is the only system in which the hardware, operating system and



DOS computer Macintosh.



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You'll read about our latest system software breakthrough—System 7—and the exciting new capabilities it brings to Macintosh.

And you'll read about a recent independent study conducted by Ingram Laboratories, in which Macintosh computers blew the windows off 286, 386sx, 386 and 486 PCs from IBM and Compaq running graphics-based applications.**

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easily Macintosh fits
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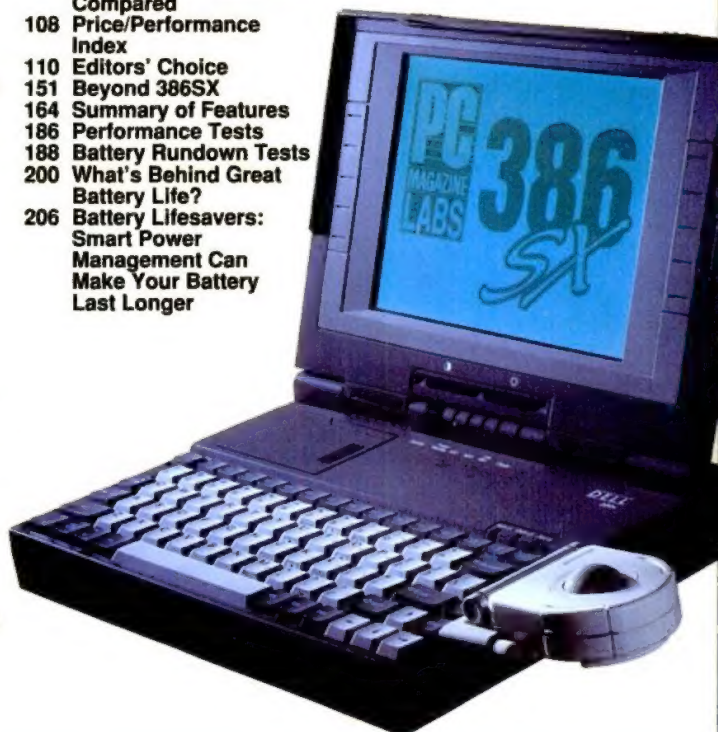
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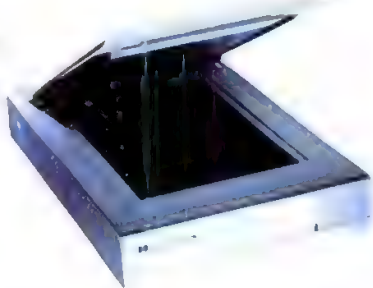
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CIRCLE 347 ON READER SERVICE CARD

Letters

Seymour Takes on Microsoft, and Word Users Are up in Arms

Jim Seymour really struck a nerve with his April 30, 1991, column, "How Microsoft Blew It with Word 5.5." The letters continue to pour in. As of this writing, readers are siding with Seymour at a rate of 3 to 1.

MICROSOFT DESTROYED WORD

Hooray for Jim Seymour! Finally someone came right out with the truth about how Microsoft has destroyed *Word*.

Richard Thompson
Prince Frederick, Maryland

Jim Seymour is completely right! I have used *Microsoft Word* from Version 3.0 to the present, including 5.5. Microsoft has rudely abandoned the users of DOS *Word*. Version 5.5 doesn't have the characteristics that made me choose *Word*; I intend to stick with 5.0.

Tom Freeland
Oxford, Mississippi

Microsoft and its customers would have benefited if the former had kept its *Word*.

Jeffrey Rayner Myers
Baltimore, Maryland

Now I understand how a company like *WordPerfect* got to the top of the word processing heap: consideration for its customers. Simple, huh?

Ralph Foxnose
Southampton, New York

Thank you, Jim, for saying in print what I've been muttering under my breath for the last few months!

Larry M. Baker
Fairbanks, Alaska

The changes in *Word 5.5* are so enormous (and so bad) that we may use this as an opportunity to move our users over to *WordPerfect*, despite the fact that we have been using *Word* since Version 1.0.

John Brown
Jacksonville, Florida

I'm going to stay with tried-and-true *Word 5.0* until hell freezes over. You know, if Mr. Gates keeps this up, I'm not going to buy his products anymore.

Jim Densmore
Thousand Oaks, California

The end result of this fiasco will *not* be to lead the *Word* user base to *Word for Windows*, but rather to alienate a legion of loyal *Word* partisans. Are you listening, Bill Gates?

Grey Pierson
Arlington, Texas

With 5.5, one wonders if Microsoft itself could, or would, simply admit to having made a mistake. Wouldn't that be nice?

Ah, well, fantasy is free.

Carolyn Conyers
San Antonio, Texas

I tried it, I hated it, I deleted it!

Todd Dennison
Pompton Lakes, New Jersey

BRAVO, MICROSOFT

Microsoft certainly took a risk in changing *Word 5.5's* interface. But that's what progress is all about.

I was worried when I first saw 5.5. But unlike Seymour, I found that after using the new interface for a few hours, I was quite at home with it. Microsoft shouldn't have to keep upgrading its Version 5.0—it has a winner in *Word 5.5*!

Al Sirutis
Akron, New York

What seems to have happened here is that Microsoft handed Seymour a greatly enhanced, state-of-the-art software pack-



age, and he has rejected it because it's not exactly like the old one. Is that how we reward innovation?

Randy Eichman
Fort Lauderdale, Florida

Jim Seymour has insulted those of us who appreciate the achievement *Word 5.5* represents, and worse, he may have discouraged prospective buyers!

Harris S. Galary
Howell, New Jersey

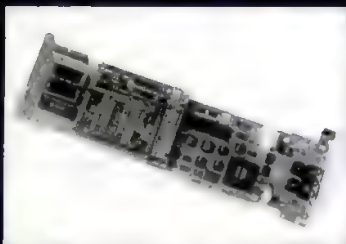
The updated interface to *Word 5.5* is now consistent with most of the latest PC software products. It is a major improvement to an already terrific product.

Jim Samuelson
Mission Viejo, California

Bill Gates couldn't have gotten so rich being dumb; he may have taken a page from Coca Cola. Perhaps what we really have is *Classic Word* and *New Word*, the latter being a mere ploy to boost sales of the former with no real life of its own.

Eric R. Stietzel
Palo Alto, California

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Letters

MODEM MAYHEM

It was a pleasure to participate in and read the article "2,400-bps Modems: Affordable Access" (March 26, 1991). However, we believe that the testing personnel might have inadvertently disengaged MNP compression while performing the test.

Our benchmark test results indicate throughputs of 6,200 bps if MNP compression is engaged. Unfortunately, your test results show throughput at only 2,300 bps.

George Zhu
Technical Director
GVC Technologies Inc.
Sparta, New Jersey

In your 2,400-bps modem story, you concluded that the Practical PM2400SA MNP/5 modem's throughput "wasn't on a par with its competitors." This published statement and the data upon which it was based are demonstrably incorrect.

We used the same TAS Model 122 Network Simulator, with the same line impairments specified in the article. We used the files supplied by PC Labs and the same communications program with the same file-transfer protocol. When the modems were properly initialized, however, we were able repeatedly to demonstrate an average throughput in excess of 650 characters per second. This is 2.8 times that reported in the *PC Magazine* review.

Michael Seedman
President
Practical Peripherals Inc.
Westlake Village, California



We regret the erroneous results reported in our article. The Practical Peripherals and GVC modems do indeed perform at the levels indicated in their companies' letters.—Ed.

THE MORE THINGS CHANGE

Twenty-five years ago, serious and emotional debates were being held throughout the computer community over two kinds of user interfaces: punch card versus terminal.

The punch card reactionaries maintained that their technology forced programmers to code more carefully, and that less computer resources were wasted. Does this sound remarkably similar to the command-line-versus-GUI letters you

have been publishing lately?

In another 25 years (or sooner, I hope) GUI hard-liners will be passionately resisting voice-recognition interfaces. Forgive the cliché, but the more technology changes, the more humans insist on staying the same.

Steve Fox
Vienna, Virginia

WHAT WE REALLY NEED

What the world needs (besides a good 25-cent cigar) is a versatile, user-friendly, low-cost statistics package that helps you choose the right test and works with data produced in *Lotus 1-2-3*.

The DOS-based statistics industry seems to consist of two parts: a few huge, expensive packages for General Motors, and several little ones for small businesses.

What the world needs
is a versatile, user-
friendly, low-cost
statistics package that
works with data
produced in 1-2-3.

It is in the latter area that someone could make a killing if he or she were willing to demystify statistics—a dull and arcane craft. The formulas are as old as meat and potatoes; what they need is McDonald's-style packaging.

I hope *PC Magazine* will tackle this subject again soon.

Sander Schimmelpenninck
Oakville, Ontario, Canada

THE INTUITIVE COMPUTING MYTH

John C. Dvorak's March 12, 1991, column, "The 'Intuitive' Computing Myth," suggests that only innovations that are intuitive are useful.

Anyone who has taught a two-year-old to use a spoon knows how *unintuitive* that tool is. How about watching a five-year-old try to tie a shoe?

I have never seen someone forget how to double-click a mouse.

Judy Floy
Bethesda, Maryland

PC WEEK \ REVIEWS

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**PC WEEK
LABS**
PRODUCT REVIEW

By David Claiborne

Tri-Star Leads 33MHz 486 PC Pack

Eight Low-Cost Systems Perform Well; Video and Hard-Disk Components Vary

"Tri-Star is king of the 33MHz 486 Mountain."

PC WEEK

Analyst's Choice, February 18, 1991

Tri-Star Computer continues to outdistance the pack as America's preferred supplier of high-end 486 Workstations. Read the reviews and you will understand why Tri-Star is the undisputed 486 champ.

"Tri-Star's 486/25 rates honorable mention for its thoughtful design touches, two year warranty and excellent service program."

PC Magazine
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September 11, 1990

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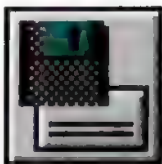
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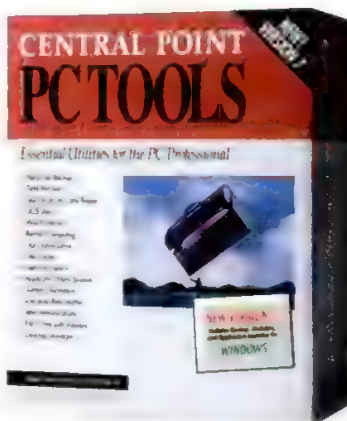
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Letters

BATTLE OF THE PORTABLES

The March 12, 1991, PC story divided portables into several categories, including "Battery-Powered 386SXs and 386DXs" and "AC-Only 386 Portables."

Only three computers had both a DX CPU and a built-in battery; this is an insufficient number to justify a separate category. Our Dataworld portables should have been grouped with the other 386DXs.

The review stated that the 19-pound weight of our systems made them "impractical by today's standards for use as a portable." However, when speaking of the Toshiba 5200/5200C, the writer says that at "almost 19 pounds, it's actually one of the lightest AC luggables available." Stranger still is that it is the same reviewer.

The LP-320 and LP-325 are criticized for their bulky packaging. Again, using the Toshiba for comparison, our machines are considerably smaller even though we have to include room in the case for the batteries (which Toshiba doesn't provide).

Given an equal chance in a retail setting, where the customer can test the unit for himself, I have no doubt the LP-325 would outsell the Toshiba 5200 by a ten-to-one margin. At 2.5 times our price, Toshiba walked away with an Editors' Choice, while we are castigated for specs that are better than or equal to theirs.

John Kuhn

Vice President, Marketing

Dataworld

Pico Rivera, California



The Dataworld 320 and 325 are unique in providing a 386DX chip and a battery. We found the Dataworld 325 to be the fastest machine among those tested. While we tend to think of battery-powered machines in terms of smaller and lighter units, the 325 addresses the needs of users who want top speed and battery operation.—Ed.

COMPUTER COLORS

Paul N. Weissler stated (in Letters, April 16, 1991) that he would be willing to pay "a bit extra" to have a machine that was a different color.

The industry *did* look into different-colored PCs, but the results were not cost-effective. Chassis manufacturers would have to make expensive changes to their plants to ensure different lines for different

colors—a cost that would be passed on.

Then there is the problem of how many chassis to buy that are red, blue, green, or gray? What happens when you sell the blue and red but not the green and gray?

My suggestion to any color-conscious consumer is to visit your local paint store and purchase their choice of enamel paint. After the warranty expires, of course.

Judy Elwood

Virginia Beach, Virginia

CORRECTIONS & AMPLIFICATIONS

In his column "Building the Right PC for Tomorrow" (March 26, 1991), Jim Seymour mentioned a "cracked keyboard." He now says "Unfortunately, the inventor hasn't yet found a vendor willing to bring out such an unconventional product."

In the March 26, 1991, New and Improved column, we should have said that Nanao USA Corp.'s 9080i is a 16-inch monitor.

In the April 16, 1991, First Looks column, we should have stated that Powercard's software is not a TSR; it operates at the BIOS level.

In the April 30, 1991, First Looks column, the address for Recognita Corp. of America should have read 1250 Oakmead Pkwy., #210, Sunnyvale, CA 94088-3599.

PowerEdit, the May 14, 1991, New and Improved "Hot Prospect," requires 470K RAM and a 12MB hard disk.

In our May 14, 1991, Connectivity column, the correct phone numbers for Support Systems International (creators of the *Station Doubler*) are 800-777-6269 and 415-234-9090.

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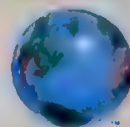
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H. Frequency:	31.5 KHZ 35.2 KHZ 35.5 KHZ	31.5 KHZ 35.2 KHZ 35.5 KHZ	31.5 KHZ 35.5 KHZ 48 KHZ
V. Frequency:	43.5 HZ 60/70 HZ	43.5 HZ 60/70 HZ	72 HZ 60/70 HZ
Resolution in Pixels:	1,024 x 768	1,024 x 768	1,024 x 768
Compatibility:	IBM 8514/A APPLE MAC II	IBM 8514/A	IBM XGA (FLICKER FREE)

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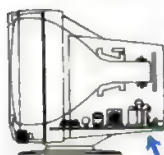
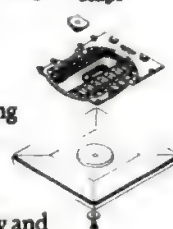
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by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

J.D. Power Tackles The Big Job of Ranking PC Customer's Satisfaction

J.D. Power & Co. sent shock waves through the car business several years ago when it publicized the first broad studies detailing what drivers really thought about the quality of their automobiles.

The company has now turned its sights on PC makers and has released its first Computer Industry Satisfaction Program

study. The initial response seems to be far cooler than the interest generated by the car industry studies, but Power is just getting started in the PC market.

Power released the results of its PC satisfaction study in May, just days before the entire industry met at Spring Comdex in Atlanta.

At the show, the research company made a presentation to the PC makers who were covered by the study, asking for their input on future studies and attempting to sell them copies of the complete study.

As it has done in the car industry, Power announced only a ranking of manufacturers to the general public; details of the study are available for fees in the neighborhood of \$50,000. While Power will sell the study to anyone, typically only the companies being studied are interested enough to pay.

Only 16 manufacturers were included in this first study. Power

chose the group based on its judgment of who the leading companies are. And because Power releases only the names of those companies it considers above average, the public will never know which companies were deemed substandard.

The names that Power released to the public, in order of best performance are: Dell, Apple (no distinction was made among hardware platforms), AST, Hewlett-Packard, Everex, CompuAdd, Compaq, Epson, Toshiba, and NEC.

This study was based on phone calls to companies in small- to medium-size offices (fewer than 499 employees). Power analyzed each brand using a wide range of product performance and support criteria that it won't divulge. Power makes no distinction among the individual models within a company's line.

Two more studies are planned for 1991. A study on PCs at home is just getting underway, and a study on PCs in large corporations (more than 499 employees) will be done toward the end of the year.

Some of the participating companies are enthusiastic about

the studies, since they feel it fills a gap in PC-industry research.

Consumers may feel cheated, since not only does Power refuse to divulge the names of companies that did not fare well, it refuses to say which models were surveyed and won't say how each aspect of performance and service was weighted in computing the scores.

The only thing certain about the Power survey is that the winners will be doing a lot of bragging.

Phoenix Designs Scheme for Intel's Battery-Saving 386SL

When First Looks reviewed the first portable to use Intel's 386SL chip set, the Zenith MastersPort 386SL (June 25, 1991, page 35), I predicted that new designs that made the best use of the chip's energy-saving features would proliferate.

Phoenix, whose BIOS helped hundreds of small manufacturers easily design desktop PCs, is now marketing a design kit that will ensure some similarity from one portable to another.

The Phoenix kit includes a

CONTINUES ON PAGE 30

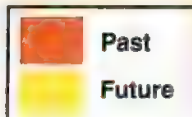


WINDOWS AND DISK UPGRADES

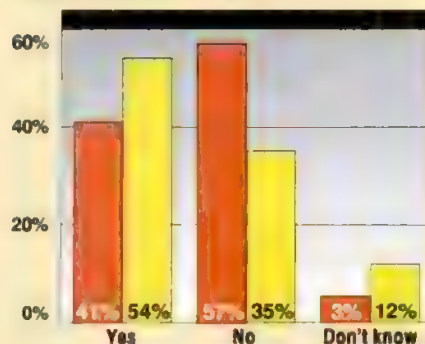
Windows' success is having ripple effects throughout the PC industry. It's still hard to predict how popular Windows applications will become (only two made it into this week's Top 15 Sellers list), but we wondered if Windows' healthy appetite for disk space was causing people to upgrade their systems' storage.

We asked callers to PC MagNet about their plans for Windows and storage. 74 percent of the 1,285 respondents said that Windows was currently being used in their organization; 56 percent of those people said they planned to increase their Windows use.

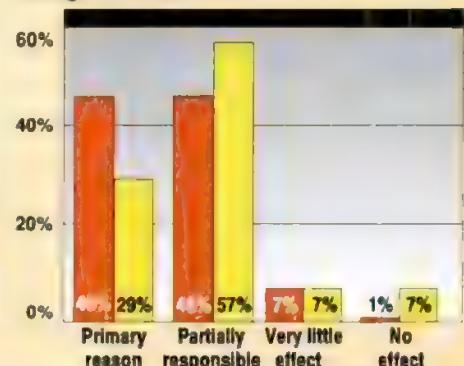
We also asked these people about adding storage, both in the systems now running Windows and in systems where Windows would be installed soon. The results at right show that most people realized before they installed Windows that it required lots of disk space.



Was more storage added after Windows' installation? Or will it be added to Windows systems in the future?



How much of a role did or will the installation of Windows have on adding storage to those PCs?



Pipeline

CONTINUED FROM PAGE 29

BIOS, a block diagram for the laptop, and firmware that monitors battery life and supports a variety of the SL's features.

The Phoenix design includes some common system building blocks, like a Chips & Technologies VGA LCD controller. It uses Intel's Flash RAM to allow for regular updates to the system's ROM BIOS. And it includes a power management strategy that has five distinct levels of power use.

Because the Intel 386SL and its supporting logic allow incredible diversity in the way that devices (keyboard, screen, disks) are powered and because Intel uses a new technique, System Management Interrupts, to manage the power flow to these devices, SL laptop design represents a new level of complexity in system design.

Phoenix also plans to incorporate support for Go Corp.'s PenPoint operating system into the SL design.

Tests That Establish PC Proficiency Are Under Development

The International Computer Training Association (ICTA)—a trade group that lobbies for PC training companies—is working with Educational Testing Service (ETS) to develop a test of PC skills.

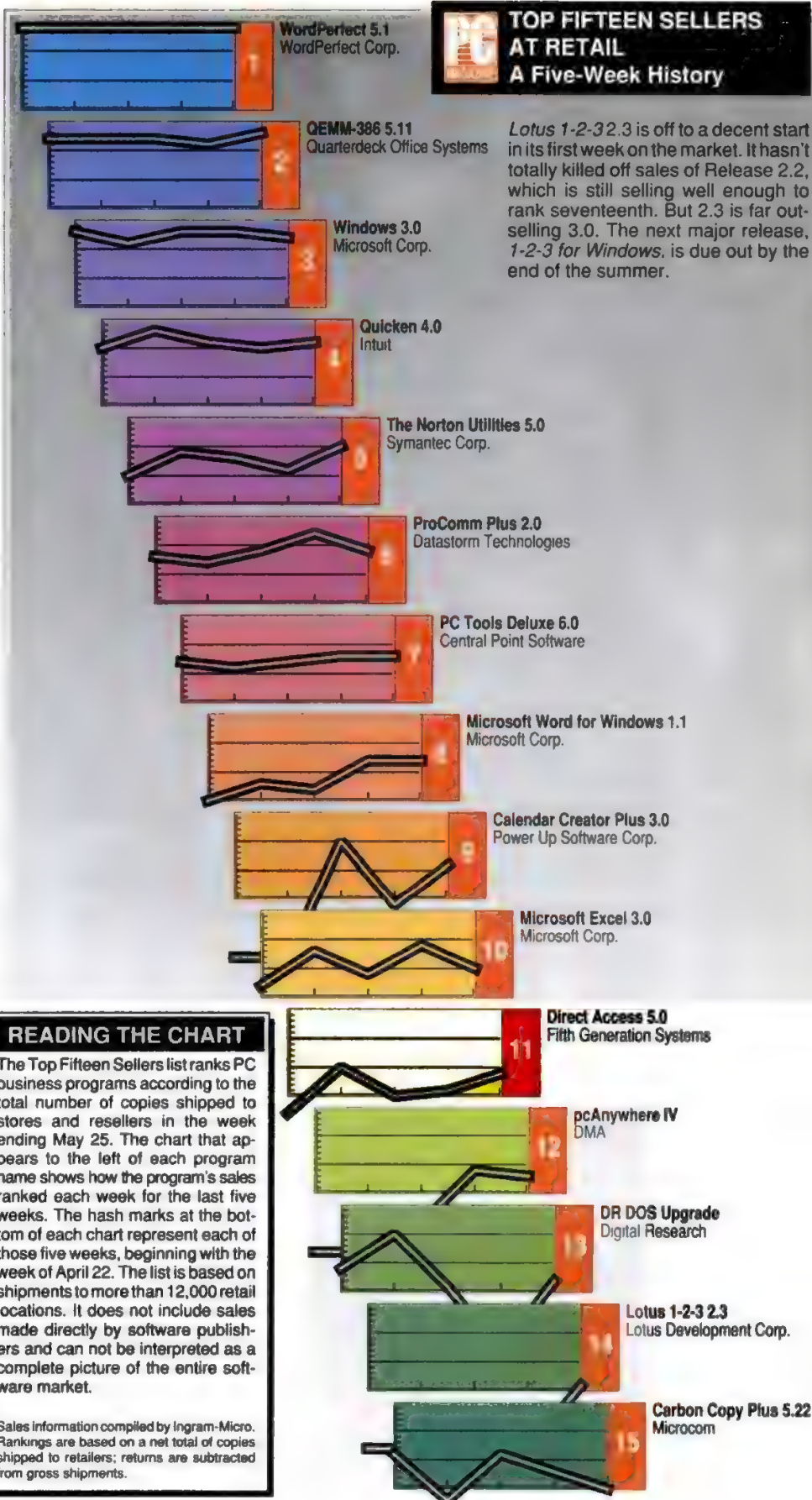
ETS is the organization that develops the SATs (scholastic aptitude tests) used by most colleges in their admission policy.

The goal is to create a nationally recognized test that would establish skill levels in commonly used PC applications, like *Lotus 1-2-3* and *WordPerfect*.

For more information, call Chris Van Valkenberg at 305-486-0644 or Jack Fox at 212-953-9800.

Correction

In the June 25, 1991 issue, the update on Broderbund's proposed merger was incorrect. The company halted talks with Sierra On-Line; Electronic Arts was not involved.



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■ *PC Resource Magazine*, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price."

■ *Personal Computing*, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

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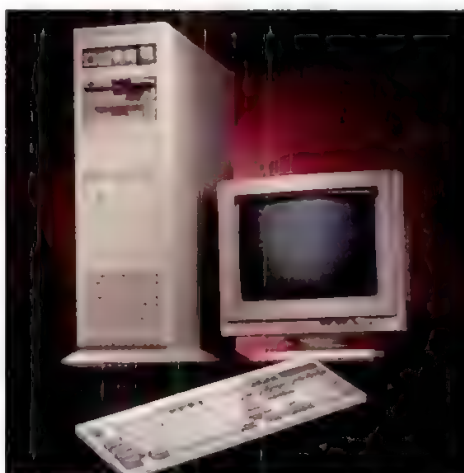
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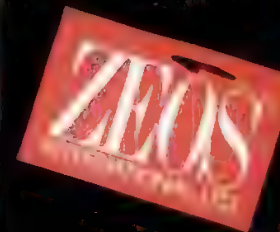
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how could you
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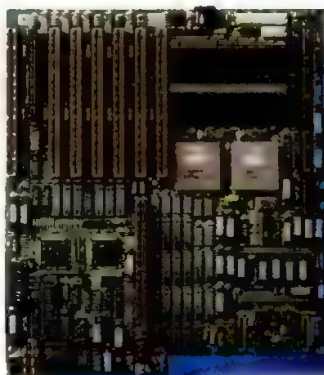
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First Looks

Hands-on Reviews of the Latest Products

Visual Basic: A Major Programming Breakthrough

HANDS ON

by Ray Duncan

Visual Basic is a breakthrough product. It will have a tremendous impact on the evolution of programming languages and the overall acceptance of GUIs in general, *Windows* in particular.

Its long-term importance can be compared with only a handful of software packages in the history of personal computing—*dBASE*, *Lotus 1-2-3*, *Turbo Pascal*, and *HyperCard*.

Why? Because Visual Basic

converts *Windows* application development from a professional specialty requiring months or years of study into a recreational activity that's accessible to even the most casual programmer.

Visual Basic works its magic by turning the traditional cycle of *Windows* program development upside down. In the conventional approach, using Microsoft C and the *Windows* Software Development Kit (SDK), you build a *Windows* program by sketching out the main modules and the logic that

links them together, and then flesh out the program in repetitive cycles of compilation, linking, and debugging.

Dialog boxes, menus, icons, and other components of the user interface are designed and compiled separately. They are controlled by the main program via a confusing hodgepodge of *Windows* functions and messages that offer many opportunities for programming misadventures.

By the time the program reaches ordinary users, the

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386SX notebook 46

sheer accumulated mass of source code deters the programmer from making any drastic changes to the interface regardless of how well the interface translates into practice.

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Rivalry Between Harvard And Freelance Gets Hotter

The rivalry between *Software Publishing* and *Lotus* in the presentation graphics market has been strong for many months now, but with competition from *Aldus Persuasion* and *IBM's Hollywood*, the two companies are being especially competitive. Both have announced plans to create *Windows* ver-

sions of their graphics programs before the end of 1991.

And as if to guarantee that the competitive fires don't wane, the two have upgraded the DOS versions of their products within days of each other.

Hands-on reviews of both and a comparative features table follow.—Ed.

Harvard Graphics 3.0

HANDS ON

by Carol Eklund

Harvard Graphics 3.0 adds a number of new ways to control graphics without sacrificing ease of use. Full mouse support supplements the oblique hierarchical menus; thankfully absent from the main menu are *Harvard's* original keyboard-driven drawing module and Version 2.3's confusing add-on module, *Draw Partner*.

In place of these "Band-Aid" drawing solutions is an

icon-based drawing screen that is tightly integrated with the main program. The drawing component contains an impressive set of tools that nearly approaches those found in some dedicated drawing programs. These include a full set of graphics primitives; you also have the ability to rotate, skew, and flip objects, draw Bezier curves, group and ungroup objects, and edit individual points on any object.

Two of the more unusual tools, *Evolve* and *Animate*, are



Harvard Graphics' new *Evolve* tool transformed this dollar sign and blended its colors.

interesting attention-getters for screen-show presentations. *Evolve* automatically blends one object or one color into another. *Animate* is a "tweening" function that draws an object across a number of frames to give the appearance of motion on-screen. A library of canned animation sequences is also included in Version 3.0.

The drawing screen's color manager puts an extraordinary array of color at your fingertips, and these colors are displayed throughout the program's modules. You can choose from 32 predefined 64-color palettes or create your own palettes from more than 16 million color options. Version 3.0 lets you cre-

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First Looks

Visual Basic

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In Visual Basic you develop the application's user interface first. You do this by painting the various objects that make up the interface—windows, dialogs, buttons, edit fields, list boxes, and the like—directly on-screen with a palette of design tools. You assign unique and descriptive names to each object.

You can use the mouse to select, move, or resize each object at any time until the appearance of the interface is exactly as you want it. You can set the various "properties" of each object, such as colors and type styles, by picking items from menus and dialog boxes. Only then do you need to turn your attention to coding.

A Visual Basic program does not reside in a single place where you can look at it as a body or print it out; instead it is made up of scores of little procedures that are scattered throughout the application's user interface like raisins in a muffin. Each procedure is associated with a particular visual object and an "event" that can happen to that object, and this association is explicit in the routine's name.

For example, the procedure "GoButton.Click" is automatically hooked to the button named GoButton. It is executed when the user clicks the mouse on that button. Procedures can inspect or change properties of visual objects, invoke special capabilities or "methods" that are associated with each type of object, trigger other events, or call on "global" subroutines that are shared by all objects in the application.

This scheme is remarkably easy to understand and use, yet it results in excellent performance because it is tightly coupled to the structure of the Windows environment, which is likewise based on visual objects, properties, and events.

The core of the Visual Basic language is Microsoft's QuickBASIC as it has existed for several years. C and Pascal pro-

grammers should not be too quick to scoff, however; QuickBASIC is every bit as "structured" as any other modern programming language, and bears very little resemblance to the GW-BASIC that has been shipped with MS-DOS since time out of mind.

Visual Basic supports user-defined data types, named constants, parameter-checking on function calls, scoping of variables, and "stream"-style file I/O—to name a few of its C-like features. It can generate .EXE files that can be distributed with no royalty or license fee, like a C or Pascal compiler.

And the particular strengths of BASIC—interactive and incremental development, complete immunity from system crashes, transparent dynamic memory management, and integrated debugging—still have no counterpart in popular C or Pascal implementations.

Visual Basic comes with two softcover manuals totalling about 800 pages. The first manual is a "Programmer's Guide" that discusses Visual Basic commands and features by functional groups, and walks you through the solution of common programming problems. It includes plenty of code snippets and screen shots.

The second manual is an exhaustive alphabetical reference to every Visual Basic command, function, object, property, method, and event. Ironically, although both manuals are excellent, the on-line help is so good that I suspect most programmers will rarely need the manuals.

Visual Basic also comes with several complete example applications in source code: a relatively simple calculator application, a moderately complex Cardfile clone, and a sophisticated Icon Editor that rivals any commercial Windows application.

In sum, Visual Basic eliminates the notorious learning curve for Windows programming and the need for pages of tortuous code to handle message passing, window repainting, device contexts, font metrics, and hundreds of other details that are unrelated to an applica-

tion's primary goal.

Instead, the program puts the emphasis in Windows application development back where it belongs—the tasteful design

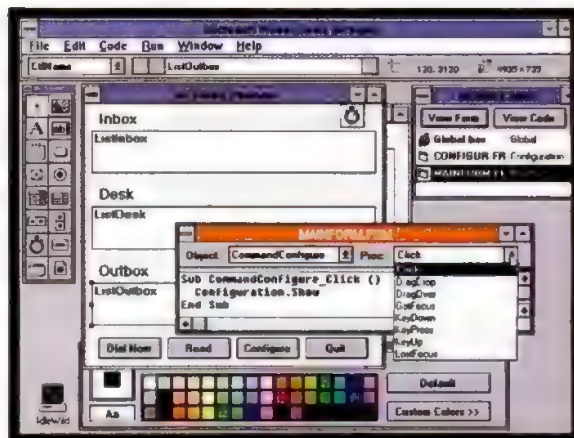
and arrangement of screen objects, and the code behind those objects to process the user's entries and display the results.

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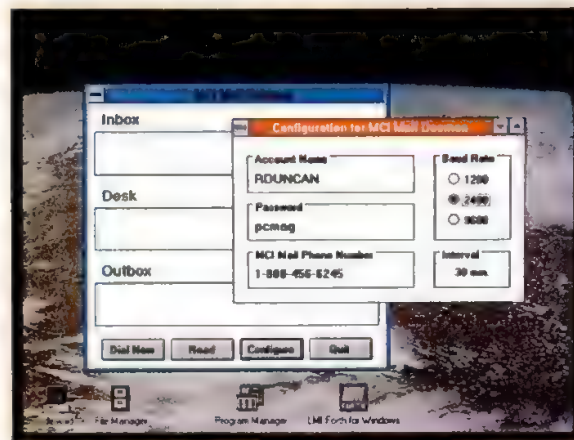
CREATING A VISUAL BASIC APPLICATION

These two screens below serve to illustrate the creation of The MCI Mail Daemon, a simple and straightforward e-mail program that is created with Visual Basic. You can adjust the interval for mail check-ins, and the program will automatically

wake up, dial MCI Mail, and look for any existing new messages. The program can quite easily be customized for other e-mail services (the full program can be downloaded from PC MagNet's Programming forum library).



Here is the Visual Basic development environment with its various design tools and palettes. In this screen, the "configuration dialog box" for a simple e-mail application is being refined.



Here the e-mail application from the previous screen has been compiled to an .EXE file and run from the Windows Program Manager like any other Windows application.

First Looks

Visual Basic

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It's no secret that the war for programmer mind share (let alone market share) has gone badly for Microsoft these last few years. While Microsoft has talked and talked about OOPs and GUI development environments, Borland has delivered a string of innovative products—Turbo Debugger, Turbo Pascal with Objects, Borland

C++ 2.0, and *ObjectVision*—that have dazzled critics and programmers alike.

Microsoft's attempts to go head-to-head with Borland in the low-end Pascal market flopped badly, and Microsoft's professional compilers have developed a reputation for being fat, clumsy, slow, and missing their release dates by wide margins.

But the Visual Basic release shows that while Microsoft may have lost a few crucial battles, the war is far from over. The elephant was only sleeping.

In short, Visual Basic defines a new and highly effective paradigm for *Windows* application development that goes far beyond Turbo Pascal, Smalltalk, *ToolBook*, or anything else available up to this time. Another visually oriented program, the \$399 *Realizer*, appears to be less slick but more powerful. A full First Look is coming.

I predict that Visual Basic and its successors will trigger a flood of high-quality *Windows* freeware, shareware, and commercial applications that we can now only dimly imagine. ■

Harvard Graphics 3.0

CONTINUED FROM PAGE 35

ate colors by using slider bars to mix red/green/blue or hue/saturation values or by using *Harvard's* Evolve feature to blend colors.

Version 3.0 also imports and displays .PCX and .TIF files. Unfortunately, this import capability is buried in the draw screen behind an icon of a tree. And to complicate matters, other import/export formats (such as CGM) are on different menus in different parts of the program, and imports from the symbol library require still a different menu. So while the overall ease of use remains high, some of the new features have been grafted on in strange and unlikely places.

Harvard is more "presentation oriented" than ever before. When you save a file for the first time, the program prompts you to save it directly to a presentation. It then takes you to a Presentation Index (a text-based form similar to *Freelance's* Portfolio) where you can change the order of files appearing in the presentation, add or delete files, apply various screen-show effects, and preview the results.

The program also includes an Auto-Build feature that automatically creates all the files you need to do an on-screen text-chart build, from a single bullet chart.

Harvard remains adept at charting. This version adds layout and design features that

make it easy to create data-driven visuals. Charts, still created with fill-in-form entry sheets, are now sectioned into predefined regions, such as Title, Data, and Footnote. This allows you to assign formatting, such as bullet types, frames, and colors, to blocks of chart areas.

There are also more chart types available. Version 3.0 adds table charts to its gallery of text, pie, and x,y charts. Tables can include automatic color-coding, so for example, you can find all the numeric data that falls within a specified range, and apply a specific color choice to values that fall within that range.

While Software Publishing Corp. hasn't added x,y,z charts, *Harvard's* standard x,y charts can be spruced up by substituting pyramids, cylinders, or octagons for bars.

The program directly supports Bitstream Speedo scalable fonts. These typefaces, used in tandem with drawing features, offer incredible control over the placement and treatment of text. For example, the To Polygon command, which lets you link one object to another, allows you to achieve dramatic effects by wrapping a block of text to an object.

Harvard's attempt at WYSIWYG computing is a device-specific preview mode that you invoke only after you've created your visual. This preview method, which is new to *Harvard*, appeared in earlier versions of *Freelance*, but the new version of *Freelance* lets you work in WYSIWYG mode

all the time.

Harvard is lacking an outliner and it isn't quite as adept as *Freelance* is when it comes to establishing live links to spreadsheet data. It cannot handle the links to 3-D spreadsheets from *Lotus 1-2-3 3.0*; *Freelance* can.

If a complete WYSIWYG environment and muscular data links are extremely important to you, *Freelance* might be the better choice. But *Harvard* still bests it in ease of use, superior drawing tools, and color management. It's an ideal package for DOS users who are in need of a strong presentation program. And while *Windows* may provide a more appropriate environment for graphics programs, *Harvard 3.0* offers enough power to satisfy any DOS shop that would rather fight than switch. ■

Freelance Graphics for DOS 4.0



With *Freelance Graphics for DOS*, Version 4.0—the program's first major revision in three years—Lotus Development Corp. has admirably expanded *Freelance's* capabilities without altering its familiar menu structure. Even though it still relies on a *Lotus 1-2-3*-like command line and fill-in-the-forms charting, *Freelance for DOS* is just about as graphic as a program can be without actually existing in a GUI environment.

Version 4.0 of the popular DOS-based presentation graph-

**FACT FILE**

Visual Basic
Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080
List Price: \$199.
Requires: 286-based PC or better, 1MB RAM, hard disk, mouse, DOS 3.1 or later, *Windows 3.0* or later
In Short: A stunning integrated programming environment for the development of *Windows* applications.
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**FACT FILE**

Harvard Graphics 3.0
Software Publishing Corp., 1901 Landings Dr., P.O. Box 7210, Mountain View, CA 94043-7210; 415-962-8910.
List Price: \$595; introductory price through December 31, \$495; upgrade from Version 2.3, \$100; upgrade from earlier versions, \$150
Requires: 286-based PC or better, 438K RAM (1MB recommended), hard disk, EGA or better display, DOS 3.1 or better; mouse recommended
In Short: Unlike previous versions, *Harvard 3.0's* drawing tools are tightly integrated. Effects like Animate and Evolve, 64 on-screen colors, and Bitstream fonts all add sophisticated effects without compromising ease of use.
CIRCLE 450 ON READER SERVICE CARD

ics package now has full mouse support, a true device-dependent WYSIWYG display, and direct manipulation of charts and objects; yet it still exists in relative comfort in a 640K DOS world.

The new version also adds a customized version of Symantec's *GrandView* outliner, and improved charting features, which keep it the preeminent DOS data-charting package.

In the past, *Freelance* users were required to work in a non-WYSIWYG mode, using a tedious print preview mode to see true colors and fonts on-screen.

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First Looks

Freelance Graphics 4.0

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Now, regardless of the selected output device, *Freelance* faithfully shows fonts (Bitstream Speedo fonts are included with the package), true color, and true gray scale.

In the past, users were required to save data and drawings as separate files—a source of constant confusion. The new version saves a single file, and for the first time, charts that have been modified with drawings or annotations can remain linked to their original spreadsheet data for automatic updates.

The addition of *GrandView LT*, a custom version of Symantec's popular outlining package, will be an obstacle or an aid, depending on the way you work. The memory-resident outliner (20K) is activated through keystroke commands. The text of a presentation can be entered directly into outline form and then poured into *Freelance*. So for example, level one headings in an outline can become titles on your slides; level two headings can be bulleted items beneath the title.

However, the marriage between *GrandView* and *Free-*

lance is quite far from perfect. Each has completely different conventions and style, and since the link between the two is unidirectional, any changes you make to the text slides in *Freelance* are not reflected in the outliner. *GrandView* has its own spell-checker, but it can work only on outlined text and not the *Freelance* charts. The outliner's formatting requirements are rigid. For example, there are limitations on the length of a headline.

Outlines can be integrated into *Freelance* presentations via Portfolio, *Freelance*'s image management/organization component. Unlike GUI-based presentation packages, which use thumbnail sketches of images as an organizational tool, Portfolio relies on a list of filenames. Portfolio also allows you to create free runtime versions of a *Freelance* presentation—a feature lacking in *Harvard Graphics* 3.0.

Traditionally strong in the data-driven charts department, the new version includes a visual gallery of chart types. Double-clicking the left mouse button on a chart type calls up the corresponding data form, and composing a chart is as simple as plugging your data into the supplied form.

This version of the program adds 3-D x,y,z bar charts and automatic data tables (where tabular data appears below a



HOW HARVARD AND FREELANCE COMPARE ON KEY FEATURES

In the features war, *Harvard Graphics* 3.0 and *Freelance Graphics* for DOS 4.0 have adopted different strategies. *Freelance* focuses on outlining and charting; *Harvard* fine-tunes its drawing.

	Harvard	Freelance
Spell-checker	■	■ (outline mode only)
Number of colors on-screen	64	13
Live links to spreadsheets	□	■
WYSIWYG fonts and color	■ (preview only)	■
Free runtime slide show	□	■
Animation effects	■	□
3-D x,y,z charts	□	■
Automatic text-chart building	■	□

■—Yes

□—No

bar, line, or area chart), bringing the total number of different chart types to 13. However, the number of data points per chart has not been increased.

In bar charts, for example, only eight different data series can be graphed at one time. Lotus incorporates the technology of its now-defunct *GraphWriter* to provide live links to external spreadsheets for automatic updates.

Consistency within presentations is accomplished via backdrop files. These files can be associated with your personal *Freelance* files through the forms menus. Twenty-eight prefabricated backdrops come with the program.

Other than an increased symbol library and automatic, more economical screen redraws, the drawing tools remain unchanged. And while they are powerful, with capabilities such as prioritizing, joining, and rotating elements, they are not especially easy to use.

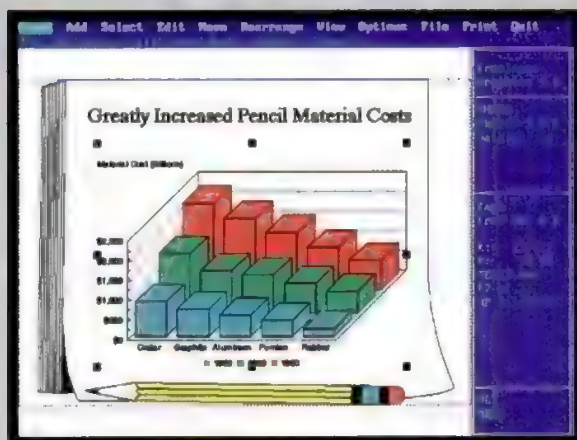
One severe limitation is *Freelance*'s inability to deal with more than 12 colors (plus a background color) at a time. Most *Windows*-based programs can handle 256 colors without difficulty. Another limitation is that TIFF files can be imported, but not displayed on-screen, and that CGM, an often problematic file format, is the primary focus of *Freelance*'s file import/export attentions.

New, slimmed-down documents do a good job of presenting detailed information, and the new SmartStart tutorial is a vast improvement over its predecessor. However, in other

ways, *Freelance* is neither fast nor streamlined. The upgrade requires 455K RAM (443K in a special reduced memory mode) and only allows you to access 64K of expanded memory. Redraws were slow on our 25-MHz 386 test machine and the huge number of hierarchically organized menus and pop-up data forms can prove to be laborious.

Experienced *Freelance Plus* users will find the \$99 upgrade price worthwhile (the upgrade price is also available to registered users of competitive products).

New users who want to stick with the DOS platform will find *Freelance*'s charting unbeatable but will probably look to *Harvard Graphics* for easier drawing tools and special effects.



Freelance's new live-linking capabilities simplify the process of using existing charts to display new data. But its limited on-screen colors might hinder some users.



FACT FILE

Freelance Graphics for DOS
Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.
List Price: Standard Edition, \$495; upgrade for users of *Freelance Plus* or comparable software, \$99. Server Edition, \$695. Node Edition, \$395.
Requires: 455K or 443K RAM (for reduced memory option), CGA or better graphics adapter, DOS 3.0 or later.
In Short: It adds a third-party outliner, strengthens its already strong data charting module, and goes true WYSIWYG, but *Freelance Graphics* for DOS is still troubled by a cumbersome menuing structure.

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\$1999.95/JE3833A

Video monitor/adaptor not included

Jameco 16MHz 80386SX Computer Kit

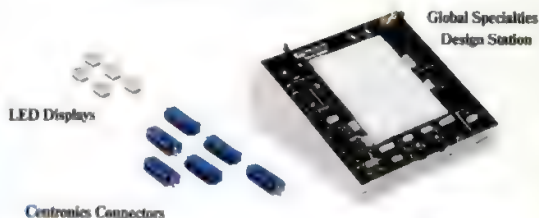
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- DR DOS 5.0 and AMI diagnostic software

\$999.95/JE3816A

Video monitor/adaptor not included



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flowing freely, companies wither and die.

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First Looks

JustWrite: A \$199 Lean, Clean Windows Word Processor

HANDS ON
by Edward Mendelson

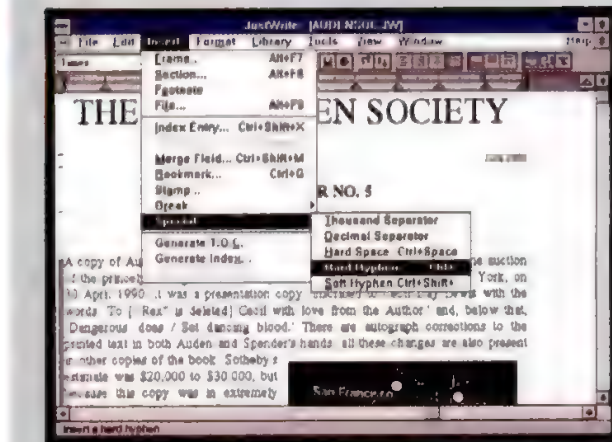
JustWrite is a Windows word processor designed simply and straightforwardly to get the job done. Symantec Corp.'s \$199 executive-level package lacks the fancy screens of a low-end program like Software Publishing Corp.'s *ProWrite Plus* and the fancy programming of high-end powerhouses like Microsoft's *Word for Windows* or Samna Corp.'s *AmiPro*—features that look great in ads and demos, but are more distracting than useful in the office.

In contrast, *JustWrite* offers a clean screen with lucid menus and unique, intelligent shortcuts for writing anything from a quick memo to a long report with outlining, footnotes, tables, imported graphics, and a multilevel index and table of contents.

When you open *JustWrite*, you'll see a screen with a ruler and customizable icon bar. By clicking on an optional "paragraph bar" at the left side of the screen, you can promote or demote outline levels, or move paragraphs up and down your file. Unlike rival packages, *JustWrite*'s detailed context-sensitive help is accessible from any open menu or dialog box.

Beyond these obvious features, *JustWrite* is rich in conveniences that become apparent with daily use. An optional "smart" delete/cut/paste function ensures that after you move a block, your text will have at least one—and only one—space before the first word and after the last word. And while most programs make you remember arbitrary key combinations to enter hard hyphens or hard spaces, *JustWrite* lets you insert them from a menu.

Another option lets you tell the program to start by opening the file you edited in the last session. You can open up to nine



JustWrite's menus give you quick access to commands that usually require using special keys in most other word processors. The anchor point for the graphic can be seen by switching to a "detailed" view that shows carriage returns, bookmarks, and other codes.

files at once, or open nine windows on the same file—although you can modify the same file in only one window.

You can transparently import files in *WordPerfect*, *Word for Windows*, *Microsoft Word*, and RFT formats; if you open a file in one of those formats, *JustWrite* can automatically save it in the same format or convert to its own format. You can also import graphics in .PCX, TIFF, .WMF, HPGL, Lotus .PIC, and Mac Pict formats, but *JustWrite* rejects large images (larger than 1,024 by 1,024 pixels); other Windows word processors are less selective. Graphics images cannot be "turned off," but scrolling is much faster than in rival programs, even with graphics on-screen.

You can create links between *JustWrite* files and any text or graphics files in a supported format. Changes to the disk file can appear in the *JustWrite* document either automatically when you open the document or manually when you enter a command. *Just-*

Write also supports one-way DDE links with other Windows applications.

A typical example of *JustWrite*'s clarity and simplicity is its handling of mail-merge documents. When you want to insert field names in a letter, *JustWrite* opens a menu that displays the field names in your chosen dBASE, Q&A, or ASCII data file. This means that you can't mistype the field name, and you can't enter a field name that doesn't exist in the data file. But simplicity comes at a price: You also can't program a merge to insert different text depending on the value of a field.

Like *Word for Windows*, *JustWrite* lets you create styles by formatting a paragraph the way you want it and then saving that format as a style. You can't easily detach a style from a paragraph, and, until you get used to them, the style menus can be excessively laconic. *JustWrite*'s styles offer basic paragraph and column formatting, but you don't get the bullets, lines, and borders that you get from the styles in *AmiPro* or

ProWrite Plus. You can, however, use lines and borders in headers, tables, and imported graphics.

JustWrite places graphics and tables in frames, which can also contain text. It's easy to edit a table or scale and partly mask a graphic, but you can't see the surrounding text when you edit inside a frame. Automatic multiple columns can have only equal widths, but you can fake variable width columns by putting text in side-by-side frames.

Despite its strong spelling, hyphenation, and thesaurus features, *JustWrite* has one major flaw that keeps it out of the ranks of high-end Windows word processors: Like the primitive early versions of *MultiMate* and *DisplayWrite*, *JustWrite* can display only one page at a time. If a sentence starts on one page and ends on the next, you can't see the whole sentence at once.

Unlike all other Windows word processors, *JustWrite* lacks a draft or galley mode that lets you see all your text regardless of page breaks. You can't view more than one page at a time even in the most reduced view. Symantec hopes to fix this problem in the next version. Also, while *JustWrite* uses far less RAM than *Word for Windows*, it uses about 20 percent more system resources.

JustWrite's uncluttered and responsive interface makes it one of the finest Windows applications ever written. But make sure you can live with its one-page-per-screen limitation before you buy.



FACT FILE

JustWrite

Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014;
800-441-7234, 408-253-9600.
List Price: \$199.
Requires 2MB RAM,
Windows 3.0 in Standard or
Enhanced mode.

In Short: A lucidly designed executive-level Windows word processor with one limitation: It can display only one page at a time.

CIRCLE 711 ON READER SERVICE CARD

After 20 Million Pages Of PostScript Color Output, The Last One Looks As Great As The First.



MacWorld World Class Award
September 1990

PC Magazine Editors Choice
November 14, 1989

recipient's tendency to act upon the information. So, in today's competitive business environment, the key question becomes, "Can we afford *not* to have the power of color?"

QMS ColorScript Printers... Brilliant and Resilient

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If it's dynamic presentations you're after, you need the Model 10. From business presentations to training programs, the Model 10 delivers vibrant, visually exciting colors that help you communicate ideas clearly. QMS screen angling technology and special presentation inks make these unusually captivating colors possible. And it's a proven fact that color presentations increase audience information retention and raise a

The ColorScript Model 30i Printer, Strictly For The Image Conscious

Extremely low cost Pantone-approved proofs in about 60 seconds. If you're a graphic designer, commercial artist or publisher it's easy to see how the Model 30i is revolutionizing your business. The QMS ColorScript 100 Model 30i is changing the relationship between speed, quality and cost by allowing you to do your job faster, cheaper and better!

The Model 30i is the first true "what-you-see-is-what-you-get" color printer. The colors you see on a Pantone-approved monitor are the same colors you'll see on a Model 30i proof *and* the same colors you'll see on the finished, printed piece. And the standard 11" x 17"/A3 paper handling capacity allows you to design actual size 8 1/2" x 11" full bleed proofs with crop marks.

True Adobe PostScript Guarantees Compatibility

Since Adobe introduced the PostScript page description language in 1984, it's become the industry standard for electronic printing and publishing. And

Features That Will Color Your Perception Of Business And Design Forever

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- 35 resident Adobe PostScript typefaces all scalable and rotatable
- Model 30i has standard 8 MB RAM/1 MB ROM
- Model 10 has standard 5 MB RAM expandable to 8 MB RAM
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- Model 30i prints letter-size and 11" x 17" paper and transparencies
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- External SCSI interface supports up to seven additional hard drives of unlimited size
- 68020 MPU-based controller plus exclusive QMS ASAP™ technology means fast first-page-out performance
- Prints high-quality Adobe PostScript text and graphics at 300 x 300 dots per inch
- HP-GL® emulation software included

with the QMS ColorScript 100 Model 10 and Model 30i, you get guaranteed compatibility and consistency. PostScript imitations, on the other hand, may not be 100 percent compatible with Adobe's PostScript.

Two Top Performers Right Out Of The Box

Whether you choose the Model 10 or the Model 30i you can be up and running within minutes. Both printers are designed for maximum compatibility with Macintosh® computers, IBM® PC's and compatibles as well as many other systems. And, for additional support, QMS's technical and service professionals are standing by to assist you with answers that will get you up to speed fast. Call us today and we'll help you decide which printer best suits your needs. Or FAX QMS Product Information at (205) 633-4866.

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On Target: Project Management for People Who Hate Project Managers

HANDS ON
by Harry Fersko-Wells

Symantec avoids the term "project management" with *On Target*. The program is billed as "Quick and Easy Project Planning." There are no references to Gantt charts or task dependencies; the term PERT chart is used only to refer to *On Target*'s graphical Work Flow window.

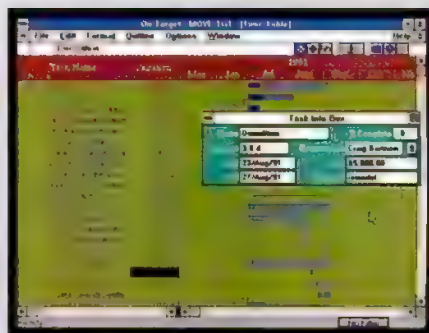
These changes in terminology go hand in hand with the use of dynamic graphics, icons, and a pop-up assistance box. In total, they make project management accessible to people who would have shuddered at the thought of this type of software.

On Target's interface combines Windows' graphical abilities with a spreadsheet meta-

phor. The main work screen is called the time table. It's split vertically into two panes. The pane on the left shows two columns: task name and duration. The pane on the right has a date line and shows bars that represent the task duration.

Each pane has a scroll bar, and a pane divider button lets you adjust the two. A wide view of the spreadsheet reveals columns for start and end dates, the person responsible for a task, and its associated costs.

When you type task names—or other data—they appear first in an edit bar above the rows and columns, just as they would in a spreadsheet. But when they're entered in the Task Name column, you can do something no spreadsheet, save



On Target's Task Info box lets you assign responsibilities and costs.

Excel 3.0, allows: You can indent tasks to create an outline, with parent tasks automatically summarizing the child tasks under them.

The outline approach makes it easy to conceptualize a project. You can start off by entering major pieces and then break them down into levels of detail. You can move tasks around in the outline, hide and reveal detail tasks, and focus on one parent/child group at a time.

Once tasks and durations have been entered, you begin to link tasks to produce a working schedule. After clicking on a linking icon at the top of the screen, you simply drag a line between tasks to have them occur in sequence. Or you could highlight a group of tasks that should occur in sequence and link them all at once with the Connect command.

Still another approach is to simply pick up a task bar using the Move icon and place it so it follows the task above it. A pop-up Schedule Assistant box then prompts you to make the specific connection. If you need to enter a lead or lag time to a linked task, you can do so by the placement of its bar, or use a pop-up Timing Info box.

The connections between tasks can be viewed in a workflow diagram that resembles the traditional PERT chart. It groups detail tasks together in a larger summary box, which is then linked to the task before and after it by arrows.

The next level of complexity would be to enter the name of the person responsible for each task and the total cost. This information can be entered directly on the task spreadsheet or in a

pop-up Task Info box.

You can also do more comprehensive project planning by clicking a couple of radio buttons in the Resources and Costs dialog box off the Options menu. Then you can enter resources, assign availability, use a resource calendar, automatically level workloads, calculate costs from assignments, and produce workload and cost graphs as well as histograms.

Because *On Target* is a Windows application, you can use fonts and color in many of the program's modules. You can also preview printouts and scale them to size. One helpful printout new to project management produces a month-by-month calendar of the project with task bars running across the dates.

On Target offers project planning in a way that is easy, even fun to do. Its embedded menus let you move on to more advanced project management without wrestling with uncomfortable jargon and concepts. ■

WHAT ON TARGET GIVES UP TO BECOME EASY TO USE

Since *On Target* is intended for the planning needs of departmental managers and individuals, you won't find some of the more advanced features common to high-end project management packages such as Symantec's own *Time Line*, Microsoft's *Project for Windows*, and Scitor Corp.'s *Project Scheduler 4*. Knowing what you are missing will help you decide if *On Target* fits your needs.

The biggest missing piece is effort-driven scheduling. Many projects are controlled by resource efforts or man-hours of work. For effort-driven scheduling, you'll have to do a great deal of paperwork to complement *On Target*'s limited capabilities. Also, *On Target* won't automatically move

tasks to balance out resource work loads.

When it comes to resource and cost management, *On Target* stops at the basics. You can't split resource assignments, have multiple resource availability, change cost rates, or compare actual to planned data down to the assignment level. There is also no way to enter cost or resource codes, although you can enter a work breakdown code. Nor can you do a full earned-value analysis.

Finally, *On Target* lacks the advanced reporting capabilities of a full-blown project management program. You can't produce detail reports, status reports, cross-tab or assignment reports, or produce a work breakdown chart.—HFW



FACT FILE

On Target

Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600.

List Price: \$399; each LAN node, \$349.

Requires: 286-based PC or better, 1MB RAM, DOS 3.1 or later, Windows 3.0.

In Short: *On Target* makes project planning easy. You create a schedule by entering data on a spreadsheet or in pop-up dialog boxes. Task bars can be directly manipulated and tasks can be linked for sequencing.

CIRCLE 712 ON READER SERVICE CARD



Our Latest PostScript Printer Technology Impressed The Experts...



MacUser,
Editor's Choice Award
(Eddy), Jan. 9, 1991



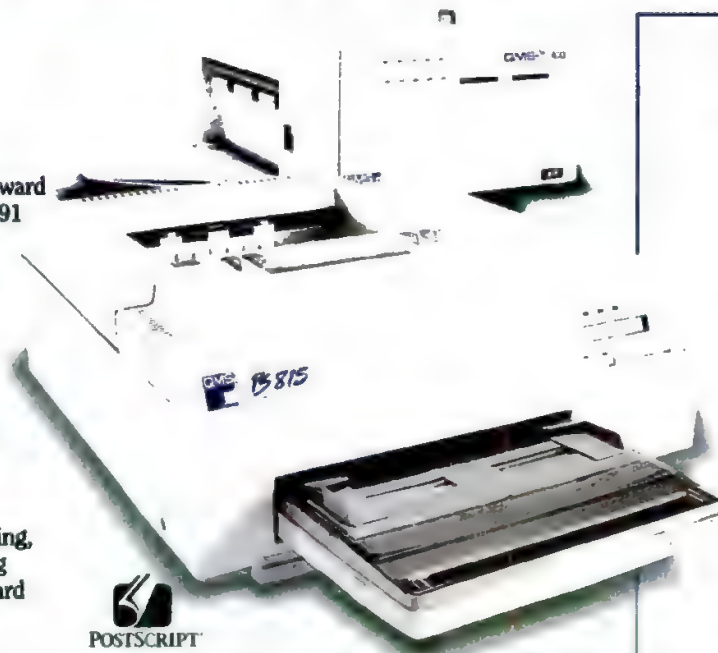
PC/Computing,
Most Valuable
Product,
Nov. 1990



BYTE,
Editor's Product
Merit Award,
Jan. 1991



1990 Personal Publishing,
1990 Outstanding
Achievement Award



POSTSCRIPT

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Before we developed the QMS-PS® 410 four page-per-minute laser printer, we performed one very important task. We listened to what you wanted. Then we engineered a printer light years ahead of the rest with features that aren't available on other printers at any price.

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Whether you choose the 410, 815 or 825, you'll enjoy the desktop design flexibility of the latest version of Adobe® PostScript®. This most recent version includes the output enhancement of Adobe Type Manager™ (ATM). All printers come standard with 45 resident typefaces scalable from 4 points upward and fully rotatable. These PostScript printers guarantee compatibility with thousands of useful PostScript applications currently on the market.

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QMS-PS 410, 815 & 825 PostScript Laser Printers

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- Front Panel Display on QMS-PS 815 & 825 (16-digit multilingual LCD array conveys printer status, allows user to quickly configure printer)
- Resident HP LaserJet Series IIP & PostScript emulations (prints PostScript & HP applications, HP-GL emulation cards available)
- QMS ASAP III Technology and 68020 Microprocessor (exclusive technology means fast first-page-out performance)
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emulation cards, HP compatible font cards, memory upgrades and extended paper handling capabilities are all currently available.

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First Looks

AT&T's Safari: Hot Design, Warm Performance

HANDS ON
by Bill Machrows

The \$5,599 AT&T Safari looks like a 1957 Philco radio. With its curves, turquoise accents, and cooling slots it looks very retro, yet fresh.

Design aside, no one can quarrel with the machine's performance and well-thought-out features. Measuring 9 by 12 inches, the Safari is no slave to the 8.5 by 11 inch gospel that pervades the notebook industry.

At 1.8 inches thick, the Safari is one of the thinnest machines in its class, yet it packs a 3.5-inch floppy, a 40MB hard disk, and full-sized peripheral connectors.

The machine comes standard with 2MB of RAM. You can upgrade it to 4MB or 6MB with the aid of a simple slide-in

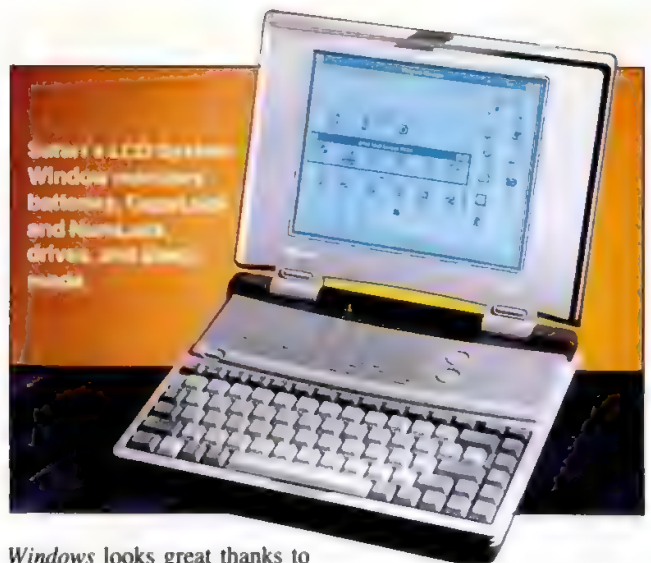
memory card.

AT&T designed the Safari's keyboard for people who hate typical notebook keyboards. Keyboard travel is generous and a complete set of keys is provided. The twin batteries bring the Safari's weight up to 7.2 pounds, but they last 3.5 hours on our battery rundown test, putting the Safari in the forefront of 386SX machines. AT&T projects 4 to 6 hours of use.

One drawback is that the it becomes warm during operation. On your lap, it can take the crease right out of your pants.

Recharging takes up to 6 hours; the charger is small and has a short 2.5-foot AC cord and a long DC lead—the perfect combination.

Software is a big part of the Safari's story. The machine boots right into *Windows*, and



Windows looks great thanks to good contrast and speed in the Safari's LCD, and a few clever modifications.

For instance, the cursor arrow is large and solid black, instead of the usual outline arrow. The I-beam in text-editing windows is several pixels thicker than usual.

The Safari clocks in at a solid 3.43 seconds on the PC Magazine Labs' Instruction Mix benchmark—consistent with 20-MHz SX notebooks. With

video caching on, video performance is among the fastest in this notebook class.

Overall, the machine performs very well and is a pleasure to use. If you can afford a Safari, you'll feel proud to carry one; it's certainly not a boring-looking computer.

List Price: AT&T Safari, \$5,599. AT&T Computer Systems, Morristown, NJ 07960; 800-247-1212.

CIRCLE 701 ON READER SERVICE CARD

Ergo Crams a 33-MHz 486 Into Its Totable Design

HANDS ON
by Matthew J. Price

Ergo Computing squeezed considerable power and performance into its 3.25- by 11.25- by 8-inch Brick PC (see First Looks review, Sept. 25, 1990). However, because Ergo failed to deliver a promised LCD panel, and because the Brick was a single-niche product, the designers were forced back to the drawing board.

Moby Brick, Ergo's new 8.6-pound 20-MHz 486SX or 33-MHz 486DX portable, injects new power into Ergo's line. The two PCs start at \$3,595 and \$4,595 respectively, and come with 4MB of RAM, expandable to 32MB, and a 40MB hard disk.

Big performance in a little case continues to be its strongest selling point: The 33-MHz 486 Moby Brick is *fast*. The 16-millionth second 212MB Conner Peri-

pherals IDE hard disk drive produced some of the fastest results in an IDE disk drive ever seen at PC Magazine Labs—33.87 seconds on the DOS File Access benchmark test. Ergo also offers a faster 13-ms. 510MB Conner drive.

Video speed is equally

strong, especially on the Bit Block Transfers (BitBlts) on our VGA performance tests. Ergo integrates Chips and Technologies' 452 VGA chip onto the systemboard for 16-bit, 1,024-by-768 Super VGA resolution. It also offers Edsun's Continuous Edge Graphics (CEG). Fast and quiet performance makes the Moby Brick an unobtrusive, yet terrific *Windows* workstation.

Moby Brick's expansion capabilities remain its Achilles heel. Or maybe Pandora's box is a better analogy, since opening up the Brick to install an I/O board remains difficult, even for the technicians at PC Labs.

Expansion is best left to the experts; Ergo's tech support staff will install any I/O card for free. But for the do-it-yourself crowd, there's a \$395 docking bay that easily accepts one 16-bit, three-quarter-length expansion board. Ergo's long-ago promised LCD will become available in August.

If you need a fast, silent graphics workstation that you might want to tote home in your briefcase, then Moby Brick is a powerful, attractive option.

List Price: Moby Brick with 8MB RAM, 212MB hard disk, Microsoft *Windows* or *DESQview* software bundle, DOS 5.0, \$5,995; docking station, \$395. Ergo Computing Inc., One Intercontinental Way, Peabody, MA 01960; 800-633-1925, 508-535-7510.

CIRCLE 702 ON READER SERVICE CARD



This 486-powered Brick computer quickly disengages from Ergo's docking bay for easy portability.

PHOTOGRAPHY: THOM O'CONNOR

The 11" x 17" PostScript Powerhouse Just \$9995!



Features That Make The QMS-PS 2210 A True PostScript Powerhouse!

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- AppleTalk, RS-232 serial and Centronics parallel interfaces mean instant connectivity in practically all environments
- Choice of 350 or 600 sheet input capacity
- SCSI port allows connection of up to seven external hard drives for font caching and permanent storage of downloadable typefaces, emulations and PostScript programs
- PS Executive Series™ utility software allows each user to name, configure and align the printer as well as download fonts from the individual host computer

22 Pages Per Minute Give It The Best Price-To-Performance Ratio On The Market

It took QMS® to engineer a 22 page-per-minute PostScript® laser printer that stretches beyond the capabilities of other printers and *still costs less!* The QMS-PS® 2210 reaches beyond many others by giving you all popular paper sizes up to 11" x 17"/A3-size printing capability. And it surpasses others in print quality as well with laser-sharp fine line detail and rich saturated black fill areas. No more pale cut-and-paste newsletters, no more mismatched spread sheets, no more engineering and design projects held together with staples and tape! And the 2210 beats the competition price-wise, too, by delivering all this and more for just \$9995.

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CIRCLE 141 ON READER SERVICE CARD

First Looks

Publisher's Paintbrush Lowers the Cost of 24-Bit Color Image Editing

HANDS ON
by Barry Sadow

Windows-based paint programs are sprucing up their images—adding 24-bit color editing and offering more image manipulation features. ZSoft's \$495 *Publisher's Paintbrush* 2.0 follows close on the heels of ULead's \$795 *PhotoStyler* (See First Looks, June 25, 1991) but offers almost all of *PhotoStyler*'s capabilities for less.

The features set of both of these paint products is partially defined by Adobe's *PhotoShop*, a standard on the Mac. And while they're called paint programs, they bear about as much resemblance to the original bit-tiddling black-and-white *PC Paintbrush* as *Ventura Publisher* does to EDLIN.

While the 16.7-million color (24-bit) capability is a sensational addition, *Publisher's Paintbrush*'s enhanced 256 gray-scale capability is more significant for the vast majority of laser printer users.

In addition, the new version drives a variety of scanners and includes tools that cleverly calibrate your scanner and printer to compensate for hardware variations. The manual includes a

special card that you scan that automatically builds a compensation map for the scanner. Then you print out a standard gray scale, scan that output in, and *Publisher's Paintbrush* compensates for any difference.

More than in previous versions, *Publisher's Paintbrush* makes intelligent use of Windows. Especially handy is its utilization of the Multiple Document Interface (MDI), which lets you open multiple files in distinct subwindows.

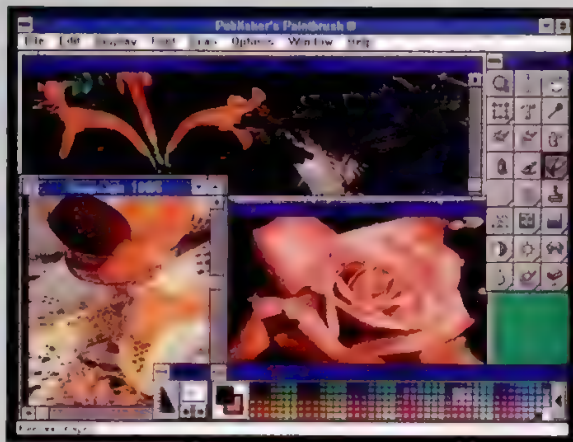
For example, you might open multiple copies of the same file and link the windows to edit a magnified view in one window while seeing the effects unmagnified in another window. Or you can load unlinked copies of the same file and view the original file in one window as you edit in another.

As with other paint programs, *Publisher's Paintbrush* displays a palette, brush adjuster, and a toolbox. Only now these are displayed in floating windows—so you can drag them around the screen and place them as necessary.

The toolbox is especially clever; there are 42 tools, but you can display them in grouped formats in order to reduce on-screen clutter. A group that might include a filled rectangle, rounded rectangle, ellipse, and polygon would appear in the toolbox as a small triangle. Clicking on the triangle displays the full group of items.

Standard draw tools have also been power-charged. For example, you can magnify an image as large as 3,200 percent and zoom out to as little as 3 percent. You can utilize gradient fills—either horizontal or vertical gradients.

Font support is strong. You can enter text with ZSoft's proprietary bitmapped and outline formats (the package includes 15 bitmapped fonts in 2 families



Publisher's Paintbrush makes good use of the Multiple Document Interface specification. With several different graphics images on-screen, you can easily experiment with different special effects.

and 18 outlines) or use URW outlines. The package has conversion utilities to allow access to any HP LaserJet or Windows screen bitmapped font.

Two particularly spectacular tools are a local Undo and Clone. With the local Undo, your brush undoes the previous operation as you drag it over the picture. To use the Clone tool, you open two pictures, click on one and move to the other. As you drag your brush over the second picture, the pixels from the click area of the first are copied onto the second.

The program includes a variety of filters to smudge, brighten, and sharpen, and a number of custom filters like motion blur and emboss.

Missing from *Publisher's Paintbrush*, but available in *PhotoStyler*, are tools like a magic wand that will select a part of a bitmap image and try to identify object borders based on color changes. You can edit palette colors using RGB or HSV

models, but CMYK is not supported and there are no color separation tools.

Publisher's Paintbrush will read/write .BMP, .PCX, TIFF, 24-bit .TGA, and will read .GIF and write EPS. While an effective color-reduction algorithm displays 24-bit images in standard 256-color VGA, the program doesn't do as well with 16-color drivers. You can't create 16-color .PCX files, and both 8- and 24-bit color images are displayed with too much dithering.

You'll have more success with 16 shades of gray scale, provided your VGA board supports 16 shades of gray in its hardware mode.

Version 2.0 has its share of glitches. For example, opening a picture in one window will often reset the scroll bars in other windows. Still, if you've looked longingly at the Mac's bevy of 24-bit color editors, and you don't need the high price or extra functionality of *PhotoStyler*, your wait is over. ■

Aldus Buys Rights to PhotoStyler

Two issues ago, (June 25, 1991), ULead's 24-bit image editor, *PhotoStyler*, was reviewed and hailed as "The Only Image Editor You'll Ever Need."

In May, Aldus Corp.,

publisher of *PageMaker*, purchased the rights to market the program and is now in the process of revising the documentation. Aldus plans to re-release the program as *Aldus PhotoStyler*.

FACT FILE

Publisher's Paintbrush, Version 2.0

ZSoft, 450 Franklin Rd., #100,
Marietta, GA 30067; 404-428-
0008.

List Price: \$495; upgrade from
Version 1.0, \$75; upgrade from
PC Paintbrush IV+, \$240.

Requires: Windows 3.0.

In Short: *Publisher's Paintbrush* continues to mature, adding 24-bit color, floating toolboxes, and some unique tools for image manipulation at an attractive price.

CIRCLE 430 ON READER SERVICE CARD

A TIME OF PRICE WARS



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05

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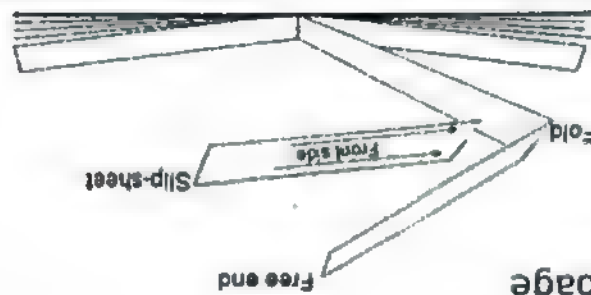
2. Insert this sheet with

1. Front side touching the free page

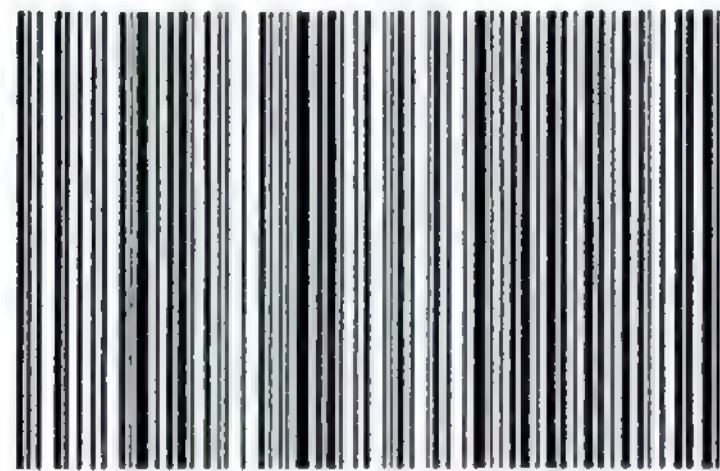
2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



Inverted Foldout slip-sheet



GbsSlipSheet-001



Folded edge of the page

Foldout slip-sheet

1. Open the foldout page

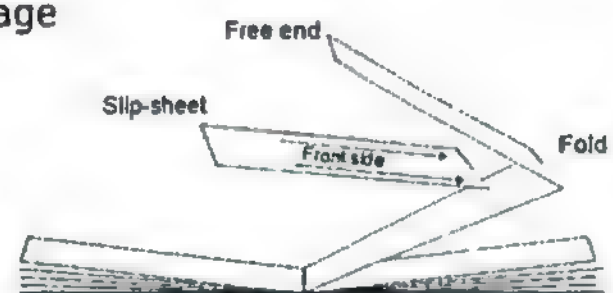
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

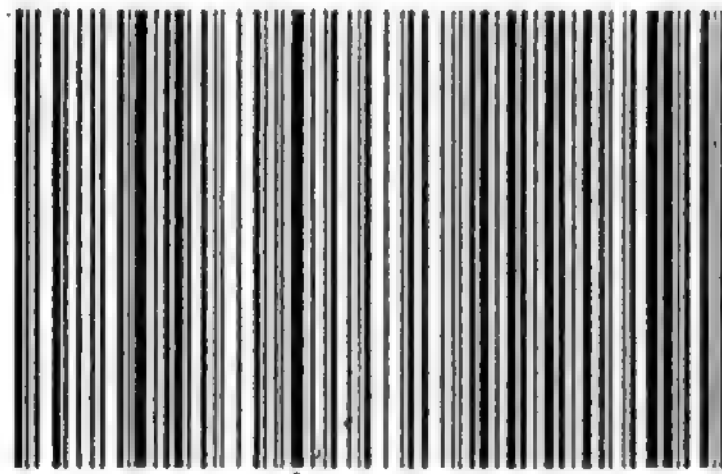
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side

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(foreground) John Baker, PC Analyst; (from left, standing) Dick Hansen, Phone Tech; Jim Bartle, Sales; Bud Reynolds, Sales; Frank Post, Production; Mark Suhr, Accounting; Ed Vandenburg, Vice President, Finance; Peter Thompson, Shipping; (from left, seated) Kevin Criddle, Phone Tech; Lane Johnson, Sales; Kevin Walz, Software Development.

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Dave Russell, Director of Purchasing: "They made me play the bad guy because I'm notorious for jousting with our vendors to get the very best prices on components—good prices we pass on to you."



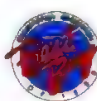
(from left, back row) Aaron Lukken, Security; Tim McCabe, Sales; Frances Chadwick, Production; (from left, middle row) Frank Gill, Shipping; Jeff Wheeler, Inventory; Thad Hollingshead, Phone Tech; (seated) Johnny Bradley, Shipping Allocator.



Bill Clemens (left), Market Research Analyst, and Mike McClendon, Market Survey Coordinator, ended up on the cutting room floor. Thanks anyway, guys!

CURTAIN CALL

The characters in our annual summer fun ad were played by a few of the 750 dedicated people who work at Gateway 2000. All photos were shot in and around our hometown of N. Sioux City, South Dakota.



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First Looks

TypeAlign Adds Special Effects to Type 1 Fonts

HANDS ON
by Luisa Simone

Adobe's talent for designing typefaces is matched only by its enthusiasm for manipulating them. The company's newest product, *Adobe TypeAlign*, is a \$99 utility that fits text to any irregularly shaped path or bounding box. It builds upon the font scaling functions of *Adobe Type Manager (ATM)*, so you can use *TypeAlign* only if *ATM* is installed on your system.

But with *ATM* and *TypeAlign* running in concert, creating special type effects—such as circular wraps or skewed perspective—is as easy as drawing a line and typing the words.

Once the text is on-screen, you'll have no trouble understanding how to move the handles to reshape the object's bounding box. Adding control points, editing Bezier curves, and using the rotation, duplica-

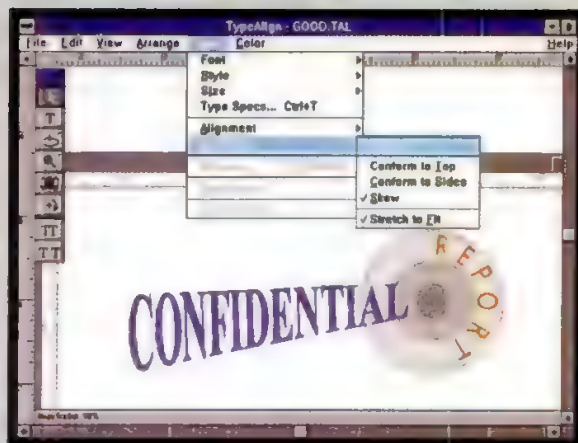
tion, or kerning tools take only minutes to master.

If the designs you create in *TypeAlign* will be used in some other document, such as a *PageMaker* file, you will need to make sure they are the correct size when they're created. Trying to resize a complex design is more trouble than it's worth.

TypeAlign's toolbox contains a camera utility, which snaps a gray-scale picture of the display in an underlying *Windows* application that you can use as a *TypeAlign* template.

Once you create a design, and color it using either a CYMK or RGB model, you can export it in EPS and AI formats, or paste it elsewhere via the *Windows* Clipboard. The lack of CGM or TIFF output is a real limitation.

Because *TypeAlign* must calculate the position of each letter on its path as you type, the screen display is painfully slow.



TypeAlign's camera utility helps ensure that the special effects you create will fit inside documents when they're imported into other *Windows* programs. The bullseye, created in *PageMaker*, was captured by *TypeAlign* before the special text effects were added.

And don't expect this \$99 program to mimic all of the functions of high-end drawing packages that cost six times as much, like *CorelDRAW*.

While designers may bemoan these limitations, business users will be absolutely thrilled with the no-fuss attitude of the program. This program expands upon the concept of

font management and transforms text creation into an artistic endeavor.

List Price: *Adobe TypeAlign*, \$99. **Requires:** 2MB RAM, DOS 3.0 or later, *Microsoft Windows* 3.0, *Adobe Type Manager for Windows*. Adobe Systems Inc., 1585 Charleston Rd., Mountain View, CA 94039; 800-833-6687.

CIRCLE 432 ON READER SERVICE CARD

21MB on a 3.5-Inch Disk: Quadram Is Close to Building a Better Disk

HANDS ON
by Ed O'Brien

Quadram's QuadFlextra disk drive is a mixture of floppy disk and mass storage. Developed by Brier Technology and based on Brier's disk technology originally developed for 4MB floppies, the QuadFlextra packs 21.4MB on the same 3.5-inch form factor disk.

The Flextra system includes a 3.5-inch drive in either an internal (\$849) or external (\$995) configuration, a SCSI host adapter, driver and utility software, and one 25MB Flextra disk. It all adds up to a marvelous package, marred only by incomplete documentation.

To squeeze the extended capacity on such a small disk, Quadram claims to use a densely packed barium ferrite substrate that is vertically polar-

ized. Normally, the ferrite substrate particles (looking much like microscopic filings and each representing 1 bit of information) are laid out end-to-end around the diameter of the disk. On the Flextra disk, the substrate material stands up vertically, so many more fit in the same physical space.

Brier's Twin Tier Tracking system uses two separate magnetic fields. One is initially applied to the bottom layer of the substrate and is used to encode the servo information the drive needs to accurately position the read/write head. The other is applied to the surface of the substrate and used to encode data.

Installing and using the QuadFlextra can be very frustrating, for the most part because of its poor user manual (if one 8.25-by-16.6-inch sheet of paper Z-folded into six sides can

be called a manual).

We ran into trouble immediately. Quadram uses The Future Domain SCSI host adapter, which uses either IRQ 3 or IRQ 5 under DOS. If you happen to use a bus mouse or a background communications program that monitors either of these IRQs (IRQ 3 is COM2), you're in trouble. The QuadFlextra will still function normally because it doesn't use an interrupt line under DOS, but it keeps those lines active so that nothing else in the system can use those interrupts. After a round of calls between Quadram and Future Domain, the solution was simply to remove the IRQ jumper entirely—an option that should have been clearly stated in the manual.

Once it's running, the Flextra is a dream, although you shouldn't expect too much in the way of performance from a dense removable drive. Based on PC Magazine Labs DOS

Disk Access and DOS File Access tests, the Flextra reads data at the equivalent rate of an IDE hard disk.

Disk writes are another story. The QuadFlextra implements Error Correction Code (ECC), a function that remaps bad sectors into unused tracks, rather than the simpler Cyclical Redundancy Check method used by most hard drives. As a result, writing data takes five to seven times longer than when done on an IDE drive.

If Quadram Corp. can polish its manual and include information problems, the QuadFlextra would get a hearty recommendation.

List Price: QuadFlextra, internal drive, \$895; external drive, \$995; QuadFlextra floppy disks, \$30; \$25 each in 10 packs. **Requires:** one 8-bit ISA slot, DOS 2.x or later. Quadram Corp., 1 Meca Way, Norcross, GA 30093; 404-923-6666.

CIRCLE 431 ON READER SERVICE CARD

First Looks

Tracking the Minutes That Groups Spend on a Project

HANDS ON
by Barry Simon

Timeslips Corp.'s newest program, *TimeSheet Professional 2.0*, is best used by corporate workgroups to keep track of their hours to assess productivity.

Unlike *Timeslips III*, the company's flagship product for billing, *TimeSheet* focuses on reporting. Each employee's timesheet looks like a spreadsheet. Columns are labeled by date; rows correspond to tasks. Tasks can be a combination of clients, projects, and subprojects—up to nine categories.

Each task has a billing rate, and the time spent on a task is entered into the table's cells. You can enter the time manually, use a pop-up window to enter starting and ending times, or activate an internal timer. Time can be segmented into billable or nonbillable periods.

The package's strength is in its report facilities. You can

quickly report summary information, such as total hours per task, or you can create detailed reports showing breakdown by client or project. A report could detail a client by employee or an employee by client. Built-in calculations help generate report subtotals and other summary information.

The program has no resident mode, so it isn't very useful for certain billable tasks such as timing a phone call. But since *TimeSheet* records time by reading the system clock, and works with multitaskers like *DESQview* and task switchers like *Carousel*, you can jury-rig a system to do these sorts of things. *TimeSheet*'s reports can be used as invoices, but fonts are not supported in printouts.

TimeSheet is paradoxical in its implementation of many of its features. Though it is highly customizable with things like renaming categories, it is rigid elsewhere. You cannot, for ex-

The screenshot displays a window titled 'Summary Report: Client Billings by Month'. It features a table with columns for 'Total Hours', 'Total Amount', 'Total Expenses', 'Billed Hours', 'Billed Amount', 'Unbilled Hours', 'Unbilled Amount', 'Billable Hours', 'Billable Amount', 'Non Billable Hours', 'Non Billable Amount', 'Non Billable Expenses', 'Budget Hours', 'Budget Amount', and 'Cost Hours'. The data is organized by month, with 'Sept. 1992' and 'Oct. 1992' visible. The bottom of the window shows a status bar with instructions: 'Cursor keys scroll, (ENTER) selects and (ESC) exits choice menu'.

Almost a mini-project manager, *TimeSheet Professional*'s reporting module provides detailed reports on an employee's time expenditures.

ample, change screen colors. The interface is slick, with pop-up boxes, and yet the program lacks mouse support. There is context-sensitive help, but no help index. Nor can you browse the help selections.

TimeSheet supports ASCII import and export only. A \$99 add-in, *D/X Data Exchange*, provides links to Computer Associates' *SuperProject*, Symantec's *Time Line*, and Microsoft's *Project for Windows*.

The package is available in standalone and network versions, with the latter adding password protection to files. ■

List Price: *TimeSheet Professional*, Version 2.0, \$199.95; eight-user network version, \$999.95. **Requires:** 420K RAM, DOS 2.1 or later (DOS 3.1 required for the network version). Timeslips Corp., 239 Western Ave., Essex MA 01929; 508-768-6100.

CIRCLE 706 ON READER SERVICE CARD

Right Hand Man Cuts Competition, Adding CUA, Voice and Fax Support

HANDS ON
by Kimberly Maxwell

Futurus's *Right Hand Man*, a network calendar/e-mail/scheduling package, received an Editors' Choice award in the September 26, 1989, review "LAN E-Mail: Spreading the Network News."

Right Hand Man II (RHM II) preserves *Right Hand Man*'s award-winning features: real-time chat, group and individual scheduling, a phone message center, and e-mail, but now adds a handsome CUA (Common User Access) interface.

The package has zesty new voice messaging features plus the ability to view faxes. Important add-ons such as *Right Hand Man Remote* (\$299 per host machine) and *Right Hand WAN* (\$695 per

server) cover new territory. *Right Hand WAN*, for example, allows *RHM II* to access another server's resources by attaching to the server transparently.

RHM II's new voice e-mail integrates Artisoft's Sounding Board adapter (available for \$99 from Artisoft, 575 E. River Rd., Tucson, AZ 85704) into its electronic mail module. Messages can be recorded and played back using either macro keystrokes or *RHM II*'s menu selections. Macros make voice mail as easy as using a touch-tone phone.

Wide area, as well as local network solutions, are supported. You can link to other MHS e-mail systems and operate the chat module—with five users writing to each other in real-time—provided you have a Net-

BIOS or Novell network.

Some handy accessories include a personal and group scheduler, a Cardfile, a phone message center, a notepad, and four different numeric calculators. New e-mail features include carbon copy, archiving, and keyword search. You can view faxes using several fax gateways including Alcom's *LANFax*, Calculus' *EZ-Fax LAN*, and OAZ Communications' *NetFax Manager*.

The program is flexible without sacrificing ease of use. The scheduling and calendar modules support group and private options with a variety of alarm and notification features. Information entered in one module can be easily transferred to other modules, and direct dialing from the Cardfile is supported.

RHM II's built-in database can access dBASE-compatible files, and a special utility,

DBDEF.EXE, allows you to create your own database definitions so that you can browse selected fields.

As a TSR, the program occupies as little as 4K of RAM. Its Users/Group Maintenance portion is much simpler to use than Novell *NetWare*'s complex menuing and system management system, FCONSOLE. And several utilities, such as File Manager and Print Queue Manager, are included.

Voice integration, fax viewing, remote and WAN capabilities, and the new user interface make *RHM II* one of the more useful products on the market. ■ **List Price:** *Right Hand Man II*, 5-user version, \$495; 25-user version, \$1,995. **Requires:** DOS 3.1 or later. Chat module requires a NetBIOS or Novell network. Futurus Inc., 3131 N. I-10 Service Rd., #401, Metairie, LA 70002; 504-837-1554.

CIRCLE 710 ON READER SERVICE CARD

QUICK, NAME THE WORLD'S BEST MEMORY MANAGER:

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THERE CAN ONLY BE ONE WINNER.

And when it comes to memory management, PC Magazine picked NETROOM over QEMM and all the rest.

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And, NETROOM is the only memory manager that runs on all PCs - 8088 through 80486. Not just with LANs, but even on stand-alone PCs!

That's why PC Magazine said "...it's a real winner...considering NETROOM's price and capabilities, you will find that there is no second choice."

Features:	NET-ROOM	QEMM	386 MAX
Windows 3.0 support	✓	✓	✓
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Converts Ext. to Exp.*	✓	✓	✓
Relocates to High-DOS	✓	✓	✓
Relocates to LIM 3.2 frame	✓		
Relocates to Expanded	✓		
Relocates to Extended	✓		
Works on 386/486	✓	✓	✓
Works on 8088/286	✓		
Memory Analysis Utility	✓		

*Requires NEAT CHIPSet on 286 systems.

NOW, VER. 2 WITH DOS 5 SUPPORT!

You'd think we'd leave good enough alone. But we made NETROOM even better. With special DOS 5 support like 286 expanded memory support, installation support through on-screen hot-key help, and more.

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SPECIAL LIMITED TIME OFFER!

QEMM users, don't despair. Just send us the title page of your QEMM manual, and you'll save 50% on the regular price of NETROOM (see coupon at right).

CIRCLE 292 ON READER SERVICE CARD

But hurry, this is a limited time offer - and as you probably know, everyone loves a winner!

Call toll-free **1-800-451-0551**, fax (718) 392-4212, or mail coupon to: **HELIX SOFTWARE CO. - SPECIAL OFFER** 47-09 30th St., L.I.C., N.Y. 11101 (718) 392-3100

YES!

Please send me NETROOM for:

☐ 1 user *\$79.95 s&h ☐ 4 user *\$149.95 s&h

YES!

I'd like to save 50% and trade up to NETROOM (1 user). I've enclosed the title page of any memory manager and *\$39.50 + \$5 s&h.

☐ Check ☐ MC ☐ Visa Exp. _____

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City _____ State _____ Zip _____

Phone () _____

NYS res. add 8 1/4% sales tax. Allow 2-4 weeks for delivery.

**HELIX SOFTWARE
COMPANY**

To support all of NETROOM's features on 8088/286 PCs you will need NEAT CHIPSet or expanded memory hardware.

First Looks

Foreign-Language Translator Can Cut Costs But Won't Replace Pros

HANDS ON
by Cristina Córdova

A lack of foreign-language skills can be a severe disadvantage for companies expanding their business overseas. The cost of professional translators may be a barrier for those seeking European business.

A series of translation products from MicroTac Software will not erase the need for fluent personnel, but with retail prices of \$79.95 per language for French, German, Italian, and Spanish, the software can pay for itself as a translator's aid.

Each program reads and translates an English text file. The program will *not* translate text into English.

Of course, translation is part art, part science. The *Language Assistants* series is not accurate enough to translate documents perfectly. Minor errors in tense are common, and colloquial phrases need retranslating.

The core of the program, called Translation Assistant, does the translation work. It is integrated with a handful of auxiliary reference tools: a text editor, a verb conjugator, an accent-entry utility, bilingual dictionaries, grammar help, and auxiliary dictionaries.

The auxiliary tools—except for the text editor—run as TSRs, so you can insert words from Random House's bilingual

dictionaries directly into a document. (The bilingual dictionaries can be customized.) Likewise, the verb conjugator, with 2,000 to 3,000 conjugated verbs, lets you insert the correct conjugation into a document.

Each *Language Assistant* translates text by analyzing sentences individually. It displays the English version on the left and the translated version on the right side of the screen. At any time, you can view the entire document in English, the foreign language, or both. Translated files are saved with a new file extension.

Several flaws in the *Spanish Assistant's* translator seem to be symptomatic of problems with all the versions. The Spanish version makes errors with gerunds, verb phrases, and subjunctive moods. It also treats the perfect infinitive the same as the present infinitive. In addition, the dictionary recognizes certain words only as nouns, or only as verbs, regardless of context. Sometimes *developer* translates into *desarrolla* ("develops"). *Integration* becomes *integrar* ("to integrate").

The translator also has a problem turning adjectives into adverbs. And since it does not recognize idiomatic phrases, it translates them literally. Each *Language Assistant* translates your original document according to the rules of English gram-

mar, but when it comes to language, rules have any number of exceptions. So unless you can avoid complex sentence structure and idioms peculiar to English, the results may well be incorrect.

As we went to press, MicroTac promised improved translation quality with Version 4.1. With an upgrade price of \$15, the new version of each package is supposed to resolve ambiguities more intelligently.

The *Language Assistants* series cannot truly compete with an experienced professional. But its helpful reference tools and affordable price make it a good assistant when you are working bilingually. You can depend on it to perform some of the mechanics, provided that someone does the fine-tuning afterward.

LEARNING LANGUAGE THROUGH LITERATURE

Those interested in refining their second language should consider *Transparent Language*. Rather than relying on traditional "Which way to the hotel" phrase-book learning, this \$99 program starts off with engrossing literature.

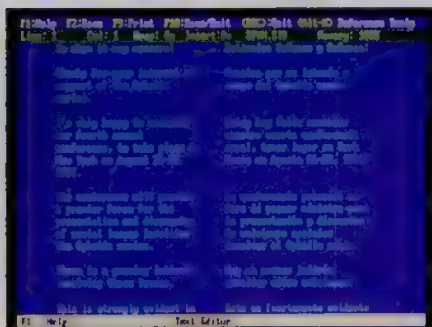
The package includes a master program, four stories, and audio cassettes of the stories read by a native speaker. Most of the stories are the original versions of classics such as Kafka's *Das Urteil* (*The Judgment*) and Ovid's *Metamorphoses*. There are some extracts from longer works, such as Cervantes' *Don Quixote de La Mancha*, as well as oddities like a French version of a story by Hans Christian Andersen—*La Petite Sirene* (*The Little Mermaid*). More texts in a greater variety of languages are in the works.

The program displays the foreign-language story on the top half of your screen, with an English translation on the bottom half. As you read, the software defines

**FACT FILE**

Language Assistants, Version 4.0
MicroTac Software, 4655 Cass St., #214, San Diego, CA 92109; 800-386-4170, 619-272-5700.
List Price: French Assistant, German Assistant, Italian Assistant, and Spanish Assistant, \$79.95 each.
Requires: 512K RAM, DOS 2.0 or later.
In Short: A program that translates English documents into either French, German, Italian, or Spanish, depending on the version. Although the translator often makes mistakes, the reference tools are quite valuable when run as TSRs under your word processor.

CIRCLE 702 ON READER SERVICE CARD



The *Language Assistants* series attempts to translate English texts into foreign languages.

every word, phrase, and sentence, and includes the translator's discretionary notes. Other features include root-word searching and the ability to hide translation windows, which lets you avoid the "cheat factor" as you become more comfortable with the other language.

As you read through a story on-screen, highlighting a foreign word brings up the English definition and displays the sentence that contained the word. If the word is part of an idiomatic phrase, the English equivalent is presented.

Reading a foreign language can now be relatively painless, since you don't have to stop continually to look words up in the dictionary. The key is that you keep reading.—CC

List Price: *Transparent Language*, \$99. **Requires:** 512K RAM. *Transparent Language Inc.*, 9 Ash St., P.O. Box 575, Hollis, NH 03049; 800-752-1767, 603-465-2230.

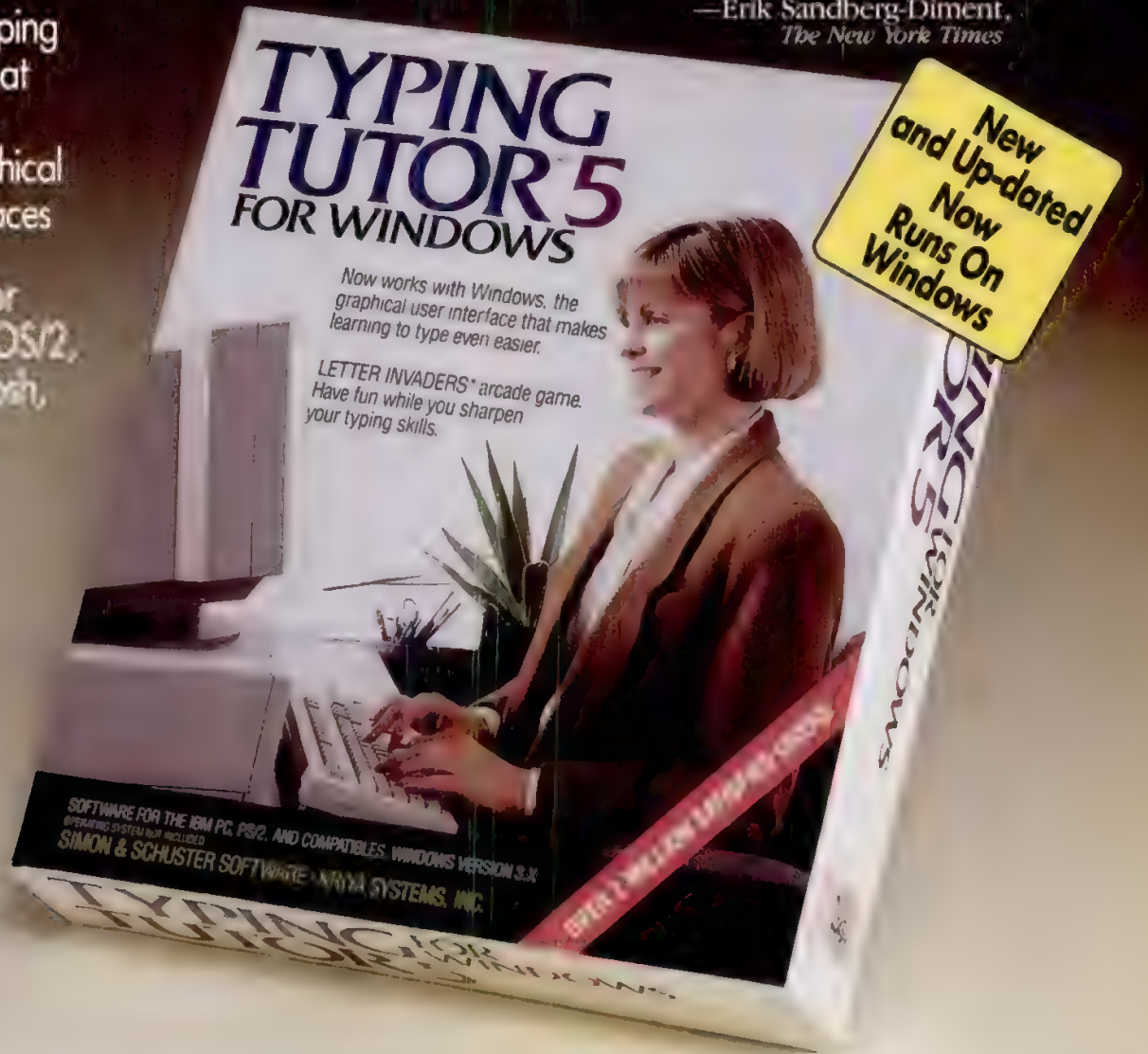
CIRCLE 703 ON READER SERVICE CARD

"The best typing instruction program for personal computing."

—Erik Sandberg-Diment,
The New York Times

► The only typing program that runs on the latest Graphical User Interfaces

► Available for Windows, OS/2, the Macintosh, and DOS



Imagine if every computer user in the world improved his or her typing. More would get accomplished. Fewer mistakes would be made. People would feel better about themselves. Announcing the world's simplest, most full-proof productivity tool—TYPING TUTOR 5.

It's New and Improved

Over 2 million people learned to type with previous versions. Now with version 5, TYPING TUTOR has been upgraded and improved to run with the latest Graphical User Interfaces (including Windows).

You get MORE compelling exercise, MORE stunning graphics, and MORE timesaving techniques.

It's Fast and Easy

In just hours, you'll increase your typing speed and accuracy. The Time Response Monitoring function *automatically*

adjusts to your level. The custom-designed lessons help you master problems. And the eye-catching graphics display your accomplishments. All you have to do is type.

And it's Lots of Fun

TYPING TUTOR 5 makes learning fun. There's a 15,000 word practice vocabulary and hundreds of varied exercises. And of course, TYPING TUTOR 5 includes Letter Invaders™, an arcade-style game that improves your typing while you defend the planet against invading letters.

Get Your Copy Today

So improve your productivity with TYPING TUTOR 5. It's available at fine computer and bookstores everywhere. Pick up your copy today.

You Can't Compute if You Can't Type

CIRCLE 257 ON READER SERVICE CARD

Why Every PC Wants Like An ALR.



ALR systems are available at these selected resellers.

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Resellers

Connecting Point **XXX**
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ALR Information Systems
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Build Performs Regardless Of Price

ALR just made choosing an SX system a whole lot easier. Whether you're looking for the economic advantages of a **386SX™** processor or the performance of an **i486SX™** CPU, we've got a system that delivers the technology of your choice for an extremely attractive price. But that's not all we deliver.

As your business grows, your processing requirements should grow right along with it. That's why you need the award-winning *Just Upgrade the CPU!*™ technology found in both these systems. This unique design makes it easy for you to replace your PowerFlex or BusinessVEISA's SX processor with a newer, faster CPU whenever your needs change. The result is a savings of hundreds or even thousands of dollars when compared to buying a new system.

And like all ALR systems, both the PowerFlex and the BusinessVEISA come with a one year limited warranty, unlimited free technical phone support, and access to our 24-hour technical bulletin board service. We even offer optional on-site service.

Visit any of our authorized resellers, and you'll find out why ALR is the clear choice. Call: **1-800-444-4ALR**

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9401 Jeronimo Irvine, California 92718

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Prices and configurations subject to change without notice. Prices based on U.S. Dollars. Shown with optional monitor. ALR is a registered trademark and BusinessVEISA is a trademark of Advanced Logic Research, Inc. All other brand and product names are trademarks or registered trademarks of their respective owners. © 1991 by Advanced Logic Research, Inc.

The ALR SX PowerFlex Entry Level System

- 16-MHz 386SX Power
- i486SX and i486 Upgradeable
- 1.44-MB Floppy Drive
- Expandable; Six ISA Slots, four drive bays
- Built-in Drive Interface for Floppy and Hard Drive
- 1-MB of RAM expandable to 16-MB
- Built-in Serial and Parallel Ports
- Optional 40- and 80-MB Hard Drives



\$995

ALR VEISA 25-MHz i486 CPU Module
ALR VEISA 33-MHz 386 CPU Module 33-MHz i486 CPU Module



The ALR BusinessVEISA 486ASX Bundle



- 20-MHz i486SX Power
- Instantly upgrades to 25-MHz i486DX™ on-board by just adding a chip
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- 32-bit EISA bus for Higher Performance
- 1.44-MB Floppy Drive
- 1.2-MB Floppy Drive
- ALR 16-bit Super VGA Adapter
- ALR FlexVIEW 2X Super VGA Monitor
- 80-MB IDE Hard Drive
- 2-MB of RAM expandable to 49-MB
- Serial, Parallel and Mouse Ports
- Microsoft® MS-DOS® 4.01 & Microsoft Windows™ 3.0 (while supplies last)

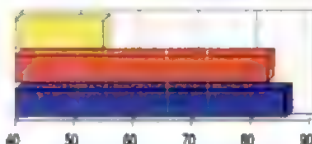
\$3,995

CRN XX Bench Combined Scores includes Performance Scores for Microsoft® Word®, Lotus® 1-2-3™, and dBase IV™. The ALR System used in testing was the BusinessVEISA Model 1700B which comes standard with a 32-bit EISA Caching controller. All BusinessVEISA systems come standard with a high-performance 32-bit EISA bus to provide maximum throughput for both the CPU and peripheral devices.

ALR BusinessVEISA 486ASX

AST Premium II 486SX/20

IBM PS/2 90 XP 486



Lower score is Better!



Put Primavera multiuser to work. And see an instant improvement in team performance.

Large projects demand more than an assembled project team. *Teamwork* is what makes things happen.

That's the essential idea behind the multiuser capabilities of Primavera Project Planner®. Unlike many "multiuser" project management packages, Primavera offers *simultaneous* access to project files—and allows *simultaneous* generation of reports and graphics. The project team gets more done because team members aren't waiting in line for computer time.

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Frequent interaction among team members is made easy with the software's own electronic mail system. You don't have to exit Primavera to leave a message for an associate or check the internal project bulletin board.

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Call **1-800-423-0245** for a free video preview of the software. Or, ask for a personal demonstration—and see firsthand how Primavera can help pull a project team together.



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CIRCLE 148 ON READER SERVICE CARD

by
Cristina Córdova
and Nate Zelnick

New & Improved

News of Announced Products and Upgrades

NCR Slate PC: On the Fast Track to Pen Computing

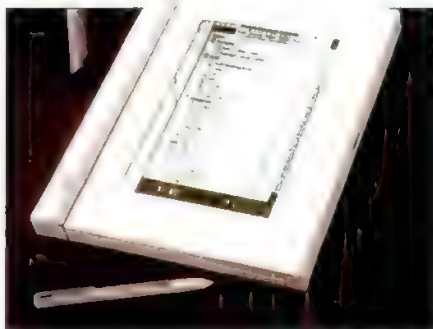
NEW NCR has begun shipping its System 3125, a stylus-based portable system that uses Intel's 386SL/20 processor. The \$4,500 system has no keyboard. It is designed to run Go Corp.'s *PenPoint*, Microsoft Corp.'s *PenWindows*, and a pen-aware version of DOS when they become available.

The System 3125 will be of interest mainly to developers of pen-based software willing to work with preliminary versions of these operating systems.

It contains 2MB of RAM expandable to 8MB, and 2MB of Flash EPROM (also expandable to 8MB) as its primary storage. Also included is a 16K cache.

Measuring 0.8 by 12 by 10 inches, the System 3125 weighs 3.9 pounds with the optional 20MB hard disk or 3.6 pounds without it. An optional external expansion unit will be needed to install software.

The system's reflective display is a triple-twist VGA LCD (480 by 640 pixels by 16 gray



NCR's stylus-based portable lets you write directly on the display.

levels) that also functions as a digitizing tablet. Users write directly on the display with the stylus that is included as standard equipment. An alarm will alert the user if the pen is not properly parked in its pen garage at shut-down.

NCR says it will ship beta copies of the software to initial customers.

List Price: System 3125, \$4,500. NCR Corp., Workstation Product Division, 1601 S. Main St., Dayton, OH 45479; 800-544-3333.

CIRCLE 441 ON READER SERVICE CARD

Fault-Tolerant Hub Switches Tokens Without Rewriting

NEW Bytex Corp.'s Maestro system allows network administrators to control and manage the physical layer of their LANs from a central management console. Priced at \$250 to \$300 per port, the Maestro system includes an intelligent switching hub, Maestro Remote Monitor software, and network management system software to create, configure, and maintain the Token-Ring.

The intelligent switching hub and its Token-Ring port station modules eliminate the need to repatch cable connections in the wiring closet manually. Network managers can reconfigure their LANs while the network is running, isolating faults electronically.

The Intelligent Switching Hub supports up to 144 Token-Ring stations and connects each port to any of 32 rings.

List Price: Maestro, \$250 to \$300 per port. Bytex Corp., Southborough Office Park, 120 Turnpike Rd., Southborough, MA 01772-1886; 508-480-0840.

CIRCLE 442 ON READER SERVICE CARD

HOT PROSPECT

CITIZEN'S PRINTER SMALL ENOUGH TO FIT IN THE SAME BRIEFCASE AS A LAPTOP

Citizen America's PN48 Professional System, a portable printer, was designed to be so compact that it should fit in your briefcase with your laptop.

The PN48 weighs 2 pounds and measures 2 by 11.5 by 3 inches. According to Citizen, the printer's thermal fusion technology offers near-laser-quality output at speeds up to 80 characters per second.

The printer is part of a \$549 PN48 Professional System that includes a 0.5-pound rechargeable nickel cadmium battery pack, an AC adapter/recharger, one single-strike ribbon, one multistrike ribbon, a soft carrying case, and the user manual (both hard copy and disk-based hypertext version).

The printer handles cut-sheet paper, labels, envelopes, and overhead transparencies; all must be manually fed one sheet at a time. It is also compatible with virtually all software packages using industry-standard Citizen GSX, Epson, and IBM line-printer emulations.

List Price: PN48 Professional System, \$549. Citizen America Corp., 2450 Broadway, #600, Santa Monica, CA 90404-3060; 213-453-0614.



Citizen's \$549 notebook printer uses thermal fusion technology.

CIRCLE 440 ON READER SERVICE CARD

Intel's SnapIn 386 Module Upgrades PS/2 Model 50s and 60s

NEW Intel's enhancement module, the SnapIn 386, replaces the 80286 CPU of an IBM PS/2 Model 50 or 60 with a 20-MHz Intel 386SX microprocessor. The \$495 SnapIn 386 module includes 16K of memory cache and a DOS device driver. It works with any Intel 80287 math coprocessor.

Kingston Technology Corp. has also introduced a family of 386SX processor upgrades for 286-based IBM PS/2s and AT-compatible systems. Available in a 16-MHz (\$645) and a 20-MHz (\$695) version, the SX/NOW! 50-60 boosts IBM PS/2 Models 50 and 60 processing power to 386SX levels. Like Intel's solution, this module plugs directly into the 80286 processor socket on the system board and contains a 16K memory cache. Kingston's module, however, also includes an on-board clock so that the 386SX processor does not have to run from the 286's clock. In addition, the SX/NOW! provides an 80386SX math coprocessor socket.

CONTINUES ON PAGE 58

BRIEFS



386SX/20 NOTEBOOKS

The following notebook PCs came on the market after the deadline for this issue's story, "386SX Notebooks: Desktop Power, Notebook Size" (page 103).

All of the notebooks utilize Intel's 20-MHz 386SX chip and ship with a 3.5-inch 1.44MB floppy disk drive, super-twist VGA LCDs, and DOS 4.01.

Goldstar Technology's 6.2-pound GS620 comes with 2MB of RAM (expandable to 4MB) and a 40MB hard disk. In addition, Goldstar packages the \$3,095 notebook with *LapLink* 3.0. 408-432-1331.

Hyundai Electronics America is packaging its \$2,995 Super-NB386Sc notebook computer with *FastLynx* file-transfer software. The 7-pound laptop ships with 1MB of RAM (expandable to 5MB) and a 20MB hard disk. 408-473-9200.

Leading Edge Products has introduced the 6.9-pound N3/SX20 notebook. For \$2,895, the N3/SX20 includes 1MB of RAM (expandable to 5MB) and a 30MB hard disk. A version with 60MB hard disk sells for \$3,195. The notebook's sidelit triple supertwist LCD supports 32 shades of gray. 800-874-3340, 508-836-4800.

Leading Technology's 6.5-pound 9800NB, priced at \$2,999, comes with 2MB of RAM (expandable to 8MB) and a 20MB hard disk. 800-999-5323, 503-646-3424.

Panasonic's 6.8-pound CF-370H6 Business Partner contains a 60MB hard disk. The \$4,799 notebook has 1MB of RAM (expandable to 5MB), a triple supertwist VGA display that generates 32 levels of gray, and a standby auto-resume function. 800-742-8086, 201-348-7000.

Toshiba's 6.9-pound T2000 SXe contains 2MB of RAM (expandable to 10MB), a 60MB hard disk, and an auto-resume function. It's the only machine in this group of notebooks to use nickel hydride power instead of nickel cadmium. 800-334-3445.

CONTINUED FROM PAGE 57

AOX's StaX SX is a 386SX cache-based upgrade module for 286 AT-bus PCs. The StaX SX operates at 16 MHz (\$279) or 20 MHz (\$329). The module is available in both plastic leadless chip carrier (PLCC) and pin grid array (PGA) versions, and it works with the less expensive 80287 math coprocessor.

List Price: SnapIn 386, \$495. Intel PCEO, CO3-7, 5200 NE Elam Young Pkwy., Hillsboro, OR 97124-6497; 800-538-3373, 503-629-7354.

CIRCLE 443 ON READER SERVICE CARD

List Price: SX/NOW!: 16 MHz, \$645; 20 MHz, \$695. Kingston Technology Corp., 17600 Newhope St., Fountain Valley, CA 92708; 714-435-2600.

CIRCLE 444 ON READER SERVICE CARD

List Price: StaX SX: 16 MHz, \$279; 20 MHz, \$329. AOX Inc., 486 Totten Pond Rd., Waltham, MA 02154; 800-726-0269, 617-890-4402.

CIRCLE 445 ON READER SERVICE CARD

4.5-lb. SX Notebooks Ship with Mouse-Compatible Touchpads

NEW Aquiline's 386SX Notebook and Fora's NBL-386S/20 are among the smallest PCs available. Both weigh 4.5 pounds and measure 1.4 by 11 by 8.6 inches with the battery installed. Both 20-MHz SXs also feature 1MB of RAM (expandable to 4MB), an external 3.5-inch floppy disk drive, a VGA LCD with 32 gray scales, and a built-in touch-sensitive mouse pad for graphical, mouse-driven software.



The 4.5-lb. Aquiline SX notebook has a mouse pad on the upper-left side.

The \$2,795 Aquiline 386SX Notebook comes standard with a 40MB hard disk, *FastLynx* file-transfer software, *FastLock* hard-disk-locking software, a battery alert, a phone book, DR DOS 5.0, and a contact management program. Aquiline also offers a 60MB system for \$2,995.

Priced at \$3,499, the Fora NBL-386S/20 notebook contains a 30MB hard disk. To conserve battery power, it includes a BIOS-controlled sleep mode, a screen-saver program, and a system-down feature.

List Price: Aquiline 386SX Notebook, 40MB RAM, \$2,795; 60MB RAM, \$2,995. Aquiline Inc., 449 Main St., Bennington, VT 05201; 800-221-1119, 802-442-1526.

CIRCLE 767 ON READER SERVICE CARD

List Price: Fora NBL-386S/20, \$3,499. Fora Inc., 3081 N. First St., San Jose, CA 95134; 800-367-3672, 408-944-0393.

CIRCLE 446 ON READER SERVICE CARD

Utility Sends Faxes Without a Fax Machine

NEW Ibis Software's \$69.95 *GoFAX* utility teams up with AT&T's fax service bureau to simplify access to remote fax machines. *GoFAX* requires only a Hayes-compatible modem and 48K of RAM; it will send common word processing, spreadsheet, or graphics file formats to AT&T's 800 number. The service representatives pick up and forward the document to any fax machine.

AT&T will then bill you, via credit card, \$3 for the first page and \$2.50 for each additional page. MCI Mail faxes cost \$0.80 for the first page and \$0.60 for additional pages; however, MCI Mail charges a monthly service fee and requires that documents be converted to text format before transmission.

GoFAX includes a dialing directory, a text editor, and a communications log.

List Price: *GoFAX*, \$69.95. **Requires:** 512K RAM, 1,200- or 2,400-bps Hayes-compatible modem, DOS 3.0 or later, credit card account. Ibis Software Inc., 90 New Montgomery, #820, San Francisco, CA 94105; 415-546-1917.

CIRCLE 447 ON READER SERVICE CARD

Everex PostScript Printer Doubles As a Plain-Paper Fax

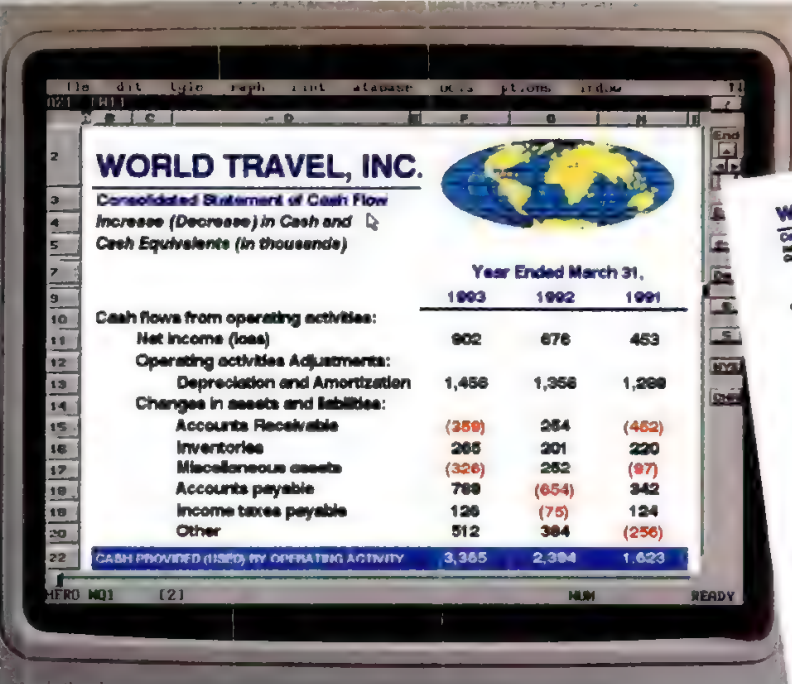
NEW The LaserScript FAX from Everex Systems is a full-featured PostScript printer with built-in send-and-receive plain-paper fax capabilities.

Priced at \$3,295, the LaserScript FAX is a 6-ppm 300-dpi printer complete with fax software that adds, edits, searches, sorts, and deletes fax number entries in the *dBASE III* or *IV* file format in its telephone database.

Powered by a 25-MHz National Semiconductor microprocessor and a floating-point accelerator, the LaserScript FAX comes standard with 4MB of RAM (expandable to 6MB), support for Adobe's Type 1 and Type 3 fonts, 35 resident Bitstream fonts, 24 resident bit-mapped fonts, and font cartridge support. It switches automatically between PostScript and PCL IV emulations.

List Price: LaserScript FAX, \$3,295. Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 800-628-3837, 415-498-1111.

CIRCLE 448 ON READER SERVICE CARD



WORLD TRAVEL, INC.

Consolidated Statement of Cash Flow
(Amounts in Cash and Cash Equivalents in thousands)

	1993	1992	1991
Cash flows from operating activities:			
Net income (loss)	902	676	453
Operating activities Adjustments:			
Depreciation and Amortization	1,456	1,356	1,208
Changes in assets and liabilities:			
Accounts Receivable	(359)	264	(452)
Inventories	265	201	220
Miscellaneous assets	(326)	262	(97)
Accounts payable	789	(654)	342
Income taxes payable	126	(75)	124
Other	512	394	(256)
CASH PROVIDED (USED) BY OPERATING ACTIVITY	3,365	2,394	1,623

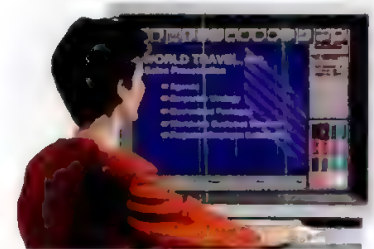
FREE
Sidewalk 2.0
See Your Dealer for Details.
(Offer good through October 31, 1991 with purchase of specially marked packages of Quattro Pro. Not valid with purchase of Upgrade version or LAN Pack.)

With Quattro Pro's WYSIWYG, what you see onscreen is what you get on paper.

Borland's New Quattro Pro 3.0

WYSIWYG and WYSIWOW!

Quattro® Pro is the hottest spreadsheet on the market. Consistently delivering the best power features: Multiple worksheet consolidation, advanced publishing and 1-2-3® compatibility.



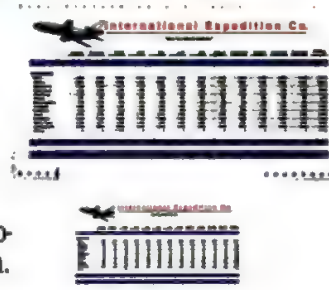
Now Quattro® Pro 3.0 adds WYSIWYG, plus

Choose from a spectacular library of fonts, colors, graphics and clip art to create winning presentations. There's even slide-show sound and transition effects!

Quattro Pro 3.0 beats 1-2-3. Again.

Feature	Quattro Pro	1-2-3 r3.1	1-2-3 r2.2
"Live" editable WYSIWYG spreadsheet	Yes	Yes	No
WYSIWYG page preview	Yes	No	No
Banner (sideways-oriented) printing	Yes	No	No
Print-To-Fit* automatically on a page	Yes	Yes	No
Backsolver technology built in	Yes	No	No
3-D graphs (ribbon, step, bar, area, pie)	Yes	No	No
Worksheet zoom	Yes	Yes	No
Draw package built in	Yes	Yes	No
Clip art library	Yes	No	No

a theatre full of graphics, publishing and presentation features that will dazzle even the most demanding audience. And, unlike 1-2-3 r3.1, all of Quattro Pro's features, including WYSIWYG, are seamlessly integrated into one set of menus, greatly enhancing ease-of-use. Just another example of how Quattro Pro's advanced technology is built in... not tacked on.



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CIRCLE 287 ON READER SERVICE CARD

Improved

BRIEFS

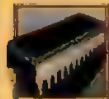


CD-ROM

Britannica Software is now offering *Compton's Multimedia Encyclopedia for Microsoft Windows 3.0* (\$895). Porting the 26-volume reference guide to *Windows* allows you to open text, sound, and video windows simultaneously. 800-533-0130, 415-597-5595.

Grolier Electronic Publishing has announced *The Grolier Electronic Encyclopedia*, 1991 Edition (\$395; annual update, \$125). This year's model adds Boolean search features, sound, and new illustrations. Grolier has added or revised approximately 4,000 articles. 800-356-5590, 203-797-3365.

NEC has released the second generation of *Type Gallery* (\$399). One CD contains locked data for 1,000 Adobe PostScript typefaces; key code for individual typefaces may be purchased by phone or fax. Any three faces are included in the initial purchase price. 708-836-7358.



MEMORY MANAGERS

Helix Software has optimized its network driver manager, *Netroom* (\$79), to use the new memory management features in DOS 5.0; it is also *Windows 3.0*-compatible. The company claims usable conventional memory gains up to 800K. 800-451-0551, 718-392-3100.

V Communications' Memory Commander (\$99.95), which the company claims provides 800K of contiguous DOS memory for VGA graphics applications and 920K for VGA text programs on 386- or 486-based machines, now runs under *Windows* and supports DOS 5.0. 800-648-8266, 408-296-4224.



PROJECT MANAGEMENT

Primavera Systems has upgraded *Parade* (\$2,000), adding an outliner, new reports, and several new graph types. *Parade* now integrates with the company's other project management products, *Primavera Project Planner* and *Finest Hour*. An upgrade to *Primavera Project Planner* is also announced (\$4,000).

CONTINUES ON PAGE 62

LANtastic 4.0 Runs Under Windows, Unloads from RAM

IMPROVED *LANtastic*, Artisoft's low-end LAN operating system, has been upgraded to Version 4.0 and can be run in a *Windows 3.0* DOS window in either Real, Standard, or protected mode. The improved network operating system also adds automatic uninterruptible power supply support, plus remote batch commands on a server to a workstation, and it may be unloaded from conventional memory without rebooting.

Artisoft has also announced the availability of *LANtastic for Windows*, an add-on to the NET and NET_MGR programs of NOS, which allows *LANtastic* to be run from within Microsoft's graphical environment. *LANtastic for Windows* is CUA-compliant.

List Price: *LANtastic*, Version 4.0, \$99 per workstation; up to 300 users, \$2,499; upgrade from Version 3.x, \$99 per network or \$50 for one workstation. *LANtastic for Windows*, \$299 per network. **Requires:** 512K RAM, DOS 3.1 or later. Artisoft, Artisoft Plaza, 575 E. River Rd., Tucson, AZ 85704; 602-293-6363.

CIRCLE 433 ON READER SERVICE CARD

32MB MCA Above Board Uses EEPROM

IMPROVED Intel has announced its next-generation Micro Channel memory expansion board, a dual-architecture version of its Above Board that supports both 16- and 32-bit MCA buses. The Above Board MC supports 256K, 1MB, and 4MB SIMMs to provide up to 32MB of extended memory or LIM 4.0 expanded memory.

The Above Board MC comes with *Softset* installation software, a utility that rewrites the configuration directly to an on-board EEPROM. It replaces the older Above Board MC32 and is backward-compatible with all previous Intel MCA-based Above Boards.

List Price: Above Board MC 5300 (no RAM), \$399; 5310 (1MB of 256K SIMMs), \$599; 5340 (4MB of 1MB SIMMs), \$999. **Requires:** MCA expansion bus. Intel Corp., C03-7, 5200 NE Elam Young Pkwy., Hillsboro, OR 97124; 800-538-3373, 503-629-7354.

CIRCLE 434 ON READER SERVICE CARD

FastTrax Fixes Larger Hard Disks

IMPROVED *FastTrax*, the disk optimization software, can now maximize hard disks with DOS partitions over 512MB. According to **FastTrax International**, the package also reduces access time for drives with more than 1,024 cylinders. Combined with **FastTrax's**

MakeTrax, the product allows flexible file placement, allowing you to choose the optimum placement of often-used files.

List Price: *FastTrax*, Version 4.03, \$69.95.

Requires: 512K RAM, DOS 2.0 or later.

FastTrax International, 8 Digital Dr., #102, Novato, CA 94949; 415-883-9561.

CIRCLE 435 ON READER SERVICE CARD

Interim Clipper Release Fixes Bugs

IMPROVED **Nantucket Corp.** has released an interim upgrade to *Clipper 5.0* to eliminate known bugs found in that release as well as to eliminate file incompatibilities found with the Summer '87 release. The upgrade, which is free to registered users, has a revised CUA-compliant debugger that offers windowing, color control, preprocessor output viewing, and source code tracing.

List Price: *Clipper*, Version 5.01, \$795.

Requires: 512K RAM, LIM EMS 3.2 or later, DOS 3.1 or later. **Nantucket Corp.**, 12555 W. Jefferson Blvd., Los Angeles, CA 90066; 213-390-7923.

CIRCLE 436 ON READER SERVICE CARD

Q&A 4.0 Adds SQL, Relational Queries

IMPROVED **Symantec** has improved *Q&A*, its integrated database and word processor. Version 4.0 adds SQL connections, relational database functions, new data views, and custom application development tools.



Q&A 4.0's natural-language query system uses pop-up boxes to build statements.

The word processor's enhancements include the ability to summarize and cross-reference data with a Crosstab report function and a 660,000-word thesaurus, as well as variable line spacing and compensation for proportional space fonts on-screen.

List Price: *Q&A*, Version 4.0, \$399; network pack (four users), \$499. **Requires:** For standalone use, 512K RAM, DOS 2.0 or later; for network use, 640K RAM, DOS 3.1 or later. **Symantec Corp.**, 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600.

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CODE: ME94

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BRIEFS

CONTINUED FROM PAGE 60

Version 4.1 now calculates schedules up to ten times as fast, according to the company. 215-667-8600.

InstaPlan Corp. has upgraded *InstaPlan* (\$249) and *InstaPlan EMS* (\$549) to Version 3.0. *InstaPlan EMS* (formerly *InstaPlan 5000*) adds network support and file locking. Both packages now offer plotter and color control, Work Breakdown Structure (WBS) support for project management, and new graphing capabilities. 415-389-1414.

Priority Management Systems now offers Version 1.7 of *The Priority Manager* (\$595 to \$695; includes on-site training). It supports networks, has a TSR mode that occupies 7K of memory with disk swapping enabled, and offers daily, weekly, monthly, and annual time scans. 604-879-6121.



BULLETIN BOARDS

Mustang Software has significantly rewritten its BBS, *Wildcat 3.0* (single version, \$129; one to ten lines, \$249; upgrades, \$50). The new system offers a mouse-driven interface, LAN gateway file-transfer capabilities, and batch transfers of up to 99 files, as well as new search capabilities and an event processor that supports up to 65,535 events on a daily or weekly basis. 805-395-0223.

eSoft has added Zmodem, more line support, and multilingual capabilities to its integrated database and BBS, *tBBS* (\$299 to \$1,995, dependent on-line capability; upgrades, \$150 to \$175). Also added to Version 2.2 is a 60,000-message capacity and support of LIM EMS 4.0. 303-699-6565.



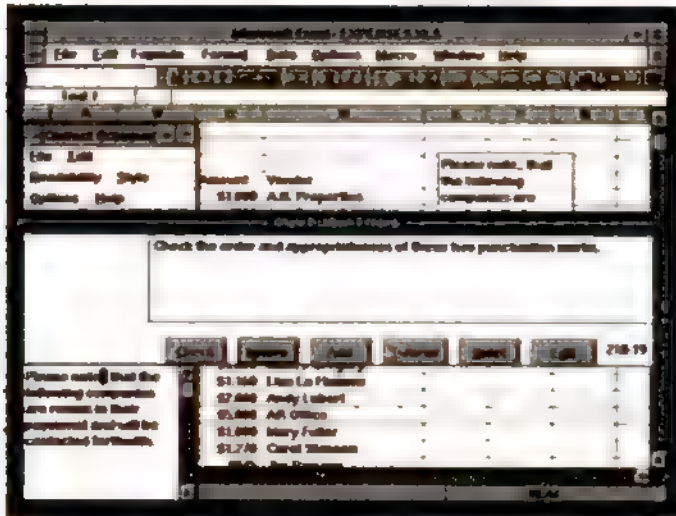
FILE TRANSLATION

Tools & Techniques has released Version 4.0 of

Data Junction (standard edition, \$99; professional, \$199; advanced, \$299). The new version of the file-translation package adds or improves its handling of *Lotus 1-2-3*, *dBASE*, and *Paradox* files, adds additional edit commands, and increases field and record capacity to accommodate up to 32K per field and 1,000 fields per record in linked databases. 800-444-1945.

Correct Grammar Ported to Windows

IMPROVED. Using a combination of DDE (dynamic data exchange) and hooks to the *Windows* Clipboard, *WordStar*'s recently acquired *Correct Grammar for Windows* fixes grammatical mistakes in any *Windows* application. In addition to fixing text in *Windows*-based word processors, spreadsheets, presentation, and page layout packages, *Correct Grammar for Windows* will also work with most DOS products and any ASCII text under DOS.



Correct Grammar uses the Clipboard to check text in any *Windows* application.

Correct Grammar highlights possible errors in a sentence-to-sentence one-pass system, then repeats the process after corrections have been made to guard against user error. The software can access user-defined dictionaries in other *Windows* or DOS-based programs. Its Style Selector function lets you create user-customizable styles that contain exceptions to grammatical rules, or you can choose from predefined business, academic, advertising, legal, informal, technical, fiction, or basic styles.

List Price: *Correct Grammar for Windows*, \$119; upgrade, \$39. **Requires:** *Windows 3.0*. *WordStar Writing Group Inc.*, 1 Harbor Rd., #111, Sausalito, CA 94965; 800-543-3873, 415-332-8692.

CIRCLE 438 ON READER SERVICE CARD

DataPerfect Optimized For LANs

IMPROVED. *DataPerfect*, *WordPerfect Corp.*'s database, has a new indexing system to improve network performance and also has a shell to link it to other applications.

DataPerfect offers two indexing utilities: *DPOrder*, which allows you to rearrange the order of reports, and *DPIInfo*, which monitors files and record sizes. Version 2.2 also features *DPPrint*, a print queue that uses the printer definitions from *WordPerfect Office's* Shell to access special characters and control printing more effectively.

Macros have been added to export database structures into a separate file, convert *WordPerfect Office's* Notebook files to *DataPerfect* databases, and merge databases with *WordPerfect* documents.

List Price: *DataPerfect*, Version 2.2, \$495; upgrades, \$89. **Requires:** 192K RAM, DOS 2.1 or later. *WordPerfect Corp.*, 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-225-5000.

CIRCLE 439 ON READER SERVICE CARD

Extra! Adds Remote 3270 Link, DOS 5.0 Task Switching

IMPROVED. *Attachmate Corp.*, maker of *Extra!* and *Extra! for Windows*, has added standard RS-232 support and direct links to *NetWare's* transport protocol, IPX, to simplify asynchronous connection to IBM 3270 mainframes from a laptop or remote client. In addition, Version 2.3 will use the task-switching option in DOS 5.0 to allow background mainframe connection.

Extra! provides 3270 connections from a network by using *Attachmate's* own 3270 Gateway Option (\$50) and, in non-ADLC (asynchronous data link control)-compliant environments, by using its Asynchronous SNA Adapter (\$1,295).

List Price: *Extra!* Version 2.3, \$425. **Requires:** Hayes-compatible modem or open RS-232 port, *NetWare* with 3270 gateway. *Attachmate Corp.*, 13231 SE 36th St., Bellevue, WA 98006; 800-426-6283, 206-644-4010.

CIRCLE 705 ON READER SERVICE CARD

MS Fortran Makes Windows DLLs

IMPROVED. Fortran programmers can now create *Windows* applications and dynamic link libraries from their DOS-based 16-bit code by using the updated compiler in *Microsoft's* Fortran Professional Development System, Version 5.1. *Microsoft* has added the QuickWin resource library to the programming environment, allowing programmers to develop CUA-compliant applications.

Microsoft's professional development systems include an improved CodeView debugger that supports large DOS programs (up to 16MB), as well as *Windows* and OS/2 programs; on-line help; the Source Browser; and Programmer's Workbench.

List Price: *Microsoft Fortran Professional Development System*, Version 5.1, \$450; upgrades, \$150. **Requires:** 286 or better, 640K hard disk space (1MB recommended), *Windows 3.0*, DOS 3.0 or later. *Microsoft Corp.*, One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080.

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w/200MB (16ms)IDE	\$4095	\$4145	\$4295	\$4495
w/330MB (16.5ms) SCSI or ESDI	\$4695	\$4745	\$4895	\$5095
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edited by
Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

A Carefully Crafted Education in Windows for C Programmers

Peter Norton's *Windows 3.0 Power Programming Techniques* takes a no-nonsense approach to teaching Windows programming. Not only do the authors, Peter Norton and Paul Yao, describe Windows programming so that potential difficulties are clear, they provide ways to overcome these difficulties. In fact, this is the best Windows programming guide to date. It begins with a creditable introduction that puts Win 3 in proper perspective alongside DOS and the OS/2 Presentation Manager. The authors describe Windows' message-driven system, event-driven programming, and how the graphics output of the Windows environment differs from character-based programming. Finally, they examine Windows' user-interface objects and how each is implemented.

These pillars of Windows programming—message-driven programming, graphics, and user-interface objects—are used as the outline for the rest of the book. Norton and Yao begin slowly, with a small Windows program, and carefully build to full-fledged applications. They use small but complete snippets of code to illustrate Windows' programming style and demonstrate the important conventions. These code examples are well chosen, and their descriptions are enlightening.

If all this sounds dull, then I have not done the book justice. It is a carefully crafted work, yet for all its directness, it is not tedious. *Windows 3.0 Power Programming Techniques* is easy to read and understand. The authors clearly know their craft. They



can program, they know Windows, and they write well about both.

Norton and Yao ensure the lasting worth of their book by packing the appendix with valuable resources, including a "taxonomy" of Windows messages organized by type, the default window procedure from Microsoft's SDK, and an extensive glossary of important terms. If it were not for a few annoying quirks, this would be a nearly perfect book. However, there is a tendency to repeat some descriptions nearly word for word, and there are some gratuitous graphics. This is unfortunate; filler is the last thing this stout volume needs.

Is It a Book on Writing BASIC Code For Windows or Is It a Clever Ploy?



Windows 3.0 for BASIC Programmers presents the reviewer with a dilemma. On the one hand we have a book that purports to "teach even the most inexperienced programmer how to write Windows applications." On the other hand, its approach is so untraditional that, in my opinion, there is a kind of implicit deception at work.

Michael Hyman's book/disk combo includes a program called *Realizer Limited*. It's a subset of the full-blown *Realizer*, which is a superset of BASIC. The only important changes from BASIC are related to I/O, as one would expect in a language tuned to Windows. Under Windows you'll need a whole new way to set

"PC Tricks" Cries Fire in a Crowded Theater

The practical joke is a time-honored tradition. When performed by a master it requires guile and a keen understanding of human nature.

Stupid PC Tricks, a book with a disk (Addison-Wesley Publishing; \$19.95), contains several programs that try only to fool an unsuspecting user into thinking his or her machine is malfunctioning or infected with a virus.



tioning or infected with a virus.

While some of the "tricks" included are games and others are visual effects, all of them are at the level of

a 1986 aspiring hacker who has just discovered the BASIC DRAW statement.

If you see a copy of this book in your office, expect the worst.—Gus Venditto

Norton and Yao's book is for power programmers; you must be an accomplished C programmer to take advantage of the material presented. If you are proficient at C and you want to understand how to program for Windows, you will not find a better resource.—Rick Ayre

Peter Norton's Windows 3.0 Power Programming Techniques

by Peter Norton and Paul Yao.
\$26.95. Bantam Books, New York, NY 10103; 800-223-5780, 212-765-6500.
ISBN: 0-553-34940-6.

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ful but slim introduction. The rest teaches you how to use *Realizer* and all of its commands.

Ultimately, *Windows 3.0 for BASIC Programmers* is a unique and ingenious way to get your feet wet programming Windows. It may not be the bargain it seems at first—after all, you can buy *Actor*, a complete Windows programming environment, for \$99—but you don't have to be a BASIC programmer to appreciate *Realizer*. There's some value here, but don't expect an education in BASIC for Windows—unless you're ready to spend another \$345.—R.A.

Windows 3.0 for BASIC Programmers

by Michael Hyman, \$29.95. Addison-Wesley Publishing Co. Inc., Reading, MA 01867; 617-944-3700.
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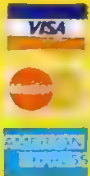
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ZD Press Launches First Book: A Connectivity Guide by Frank Derfler



To parry a phrase from Mark Twain via Jim Seymour: "Networks? Everybody talks about 'em, but nobody gets it right."

Twain declined further comment, but in the foreword to the *PC Magazine Guide to Connectivity*, Seymour speculates that networks are sometimes more theology than technology. And in the hallowed halls of the Ethernet Elders, there may be an inverse relationship between amplitude and accuracy.

That is, until now. Frank J. Derfler, Jr., *PC Magazine's* workgroup systems editor, has put together a first-rate overview

of networking in the first offering from the newly formed Ziff-Davis Press. In 13 concise chapters, augmented by two utility disks, an excellent glossary, and a foldout Connectivity Decision Tree, Derfler offers his expertise in a manner that will neither befuddle the beginner nor bore the expert. (You'll never make it as a consultant, Frank.)

Derfler begins by carefully easing his reader into the depths of connectivity, which is better than getting tossed off the deep end into protocol soup. He starts with a really simple problem: printer sharing. If that's all you need, Frank has a simple solution: a data switch. But of course you'll soon want to share data-

bases, reach out over more than 1,000 feet, absorb more than five users, connect to a mainframe, and so on. It's all here in the subsequent chapters, along with the necessary background information.

At the core of the book, Derfler gets down to business with, among other things, an introduction to "802-dot-something," the IEEE standards that define everything from cable to network access schemes. He then examines the Big Three: Ethernet, Token-Ring, and ARCnet. Derfler points out that despite its lack of IEEE acceptance, ARCnet is both economical and a safe bet for your data.

In the "Best LAN Operating Systems" chapter, Derfler reviews the features of Novell's *NetWare* family, Banyan's *VINES*, and other network operating systems. It's the sort of information you may have already gleaned from reviews, but it's conven-

ient to have it all here as a one-stop reference and comparison guide.

Derfler's connectivity guide is an excellent read for anyone interested—or already up to their ears—in networking. The book's well-designed table of contents and 13 two-column pages of index entries enhance its value as a reference work. The author says you don't have to read his book from cover to cover. But you should.—*John Woram*

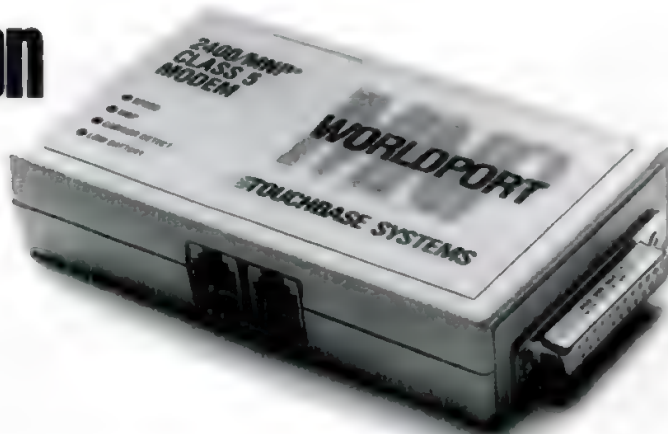
PC Magazine Guide to Connectivity

by Frank J. Derfler, Jr., \$39.95. Ziff-Davis Press, Berkeley, CA 94710; 800-688-0448, 415-528-5961. ISBN: 1-56276-001-7.

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John Woram is the president of Woram Associates, a computer consulting firm, and the author of The PC Configuration Handbook from Bantam Books.

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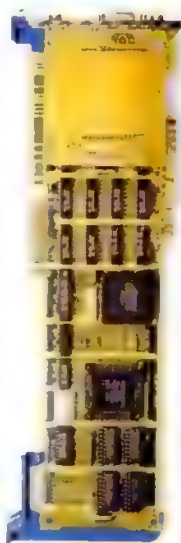
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edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

Brief, PI Edit, and SPE: Powerful, Extensible Editors

Programmers spend more time in their editors than in any other programming tool. As a result, they develop a fierce product loyalty. More and more compilers today are packaged with an editor. The two most notable are Borland's Integrated Development Environment (IDE) and Microsoft's Programmer's Workbench (PWB). But programmers' loyalty to their editors knows not the bounds of product packaging. There are many popular third-party editors.

In this issue I'll look at three recent upgrades. Intersolv is shipping *Sage Professional Editor (SPE)*, Version 1.1; The Iliad Group has released *PI Edit*, Version 4.1; and Solution Systems is shipping *Brief*, Version 3.1. The three have a number of characteristics in common.

First, all of them are fast, although optimized for different tasks. For example, in one of my tests, *SPE* loaded a large file (1MB) in 6 seconds and *Brief* loaded it in 4 seconds. However, *PI Edit* took 39 seconds. This is because *PI Edit* caches a file as it loads. Although this slows down file loading, it does speed moving from the top of a file to the end during editing. In a timed test with a 1MB file, the cursor moved from the top to the bottom of the file in less than 1 second in *PI Edit*, whereas *SPE* took 5 seconds and *Brief* took 7 seconds.

Second, *Brief*, *SPE*, and *PI Edit* all include template editing for each language they support. Template editing matches brackets, adds punctuation, and automatically creates indents and outdents. It also completes frequently used statements. For example, using *Brief*'s C-language



template, if you type `D` and hit the Spacebar, it expands the code to a complete `do...while` loop. With all of these editors, you can create custom templates, too.

A third common characteristic is that each editor can use tag libraries. Tag libraries are files that index each function so that it's easy and quick to find functions in different source code files. A search for a function will use the index to find the source code file that contains the function, load that file into the editor, and place the cursor on the line where the function appears.

Fourth, each of these editors can handle very large files and use expanded memory.

Most notable of all, though, is that these editors are extensible in two important ways. First, the keyboard handlers give you complete control over how your keyboard is mapped, one for each editing scheme the editor supports. *PI Edit*, for example, emulates *vi* (a Unix editor) as well as *Brief* and *WordStar*.

And each product will allow you to create your own scheme and modify those supplied. Second, each is extensible via a robust yet elegant macro language.

A CLOSER LOOK

Solution Systems has long held the sole right to distribute the DOS version of *Brief*, and last summer the company bought all rights to *Brief*. Version 3.1 is Solution Systems' first upgrade. In this release it has added mouse support (fully integrated into the

macro language), EMS caching, a Redo function, support for the Microsoft C 6.0 Advisor (a context-sensitive, on-line help system), and pop-up, context-sensitive language help. *Brief*'s first macro language was very LISP-like; now it sports the modern look of C with *CBrief*. Although all the examples in the manuals are in *CBrief*, *Brief* still supports its first macro language. You also get a library of functions that make it easy to customize editing, like `cut`, `next buffer`, and `next window`.

PI Edit is not as well known in the DOS world as *Brief*, but it has garnered its share of attention. It is the only one of the three that seems to be really serious about cross-platform support, running under DOS, OS/2, Interactive Unix 386/ix, SCO Xenix, SCO Unix, and AT&T Unix, and on all Sun architectures.

PI Edit has the most unusual user interface of the three editors. Its default keymap uses Control-key combinations to access functions, such as `Ctrl-Q`, to quit. When you hit a key, the package displays a submenu that explains what options are available and what each will accomplish. As a result, it is the easiest of the three to learn. *PI Edit* also has a macro language, a BASIC-like dialect, that is easy to read and learn.

Sage Professional Editor, in voluminous advertising, proclaims itself "the world's best editor." It is certainly a complete package, offering many emulations, including *Brief* and *vi*. *SPE* uses *PolyAWK* as its macro language, an implementation of *AWK*, which was designed specifically as a text-manipulation tool.

One unusual aspect is that instead of individual macros, *SPE* has one function library or file,

SAGEEDIT.AE. Once you compile a macro, you add it to this file. Most other editors, including *Brief* and *PI Edit*, have many macros, each in its own file. The disadvantage of *SPE*'s approach is that if you write a macro that has a bug such as an endless loop on entry, none of your macros are accessible until you fix the bug. So, as the manual warns, keep a backup copy of your library.

To use each program's macro language to its best advantage, you'll want access to technical support. The Iliad Group offers unlimited support by phone, but you pay for the call. Solution Systems and Intersolv have electronic bulletin boards for registered users, and *Brief* support is also available on BIX. *SPE* and *Brief* include free phone support for a limited time (at this writing, 90 days); then you must call a 900 number.

While working with these programs I rediscovered the beauty of text-mode environments: With a few well-chosen keystrokes, I extended their functionality and became more productive.

—Rick Ayre



Brief

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PI Edit

List Price: \$195; **Requires:** DOS 2.1 or later, 512K RAM. The Iliad Group, 77 Geary St., San Francisco, CA 94108; 415-563-2053. CIRCLE 696 ON READER SERVICE CARD

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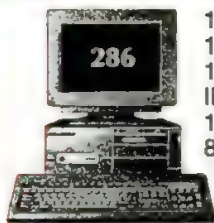
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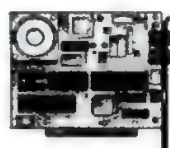
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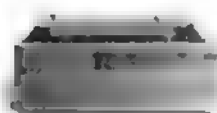
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CIRCLE 332 ON READER SERVICE CARD

Bill Machrone



CD-ROM: The Next Floppy

CD-ROM is creating quite a stir, as it rides the crest of multimedia computing. As it slowly rides the crest . . .

"Insert Spell Checker Disk in Drive A:." I'll bet you haven't seen that message for a while. Some of you young whippersnappers may have never used anything smaller than a 10MB hard disk. You've never had to shuffle floppies in order to get your work done. You've never had to think of drive A: as the program disk and drive B: as the data disk. No, this isn't one of those columns about how tough we had it in the old days. It's about how tough we're all going to have it in the brave new days brought about by the CD-ROM.

Tough, of course, is a relative term. The good news is that you get access to 550MB of data. The bad news is that you get it slowly. While CD players have always been able to produce an uninterrupted stream of bits to play music, continuous sequential access is not the way that computers typically process data.

When it comes to typical data searches, CD-ROMs are noticeably slow, although manufacturers are doing their utmost to make them speedier. Over the past five years (yes, they've really been out that long) CD-ROM drives have sped up nearly tenfold. The speed improvement has come in both track-to-track time and buffering. But the typical CD data rate of 150K per second still seems anything but fast when you compare it with hard disk performance. It's a curious trip back to yesterday for users conditioned to near-instant response.

Barry Cinnamon is a cofounder of the Bureau of Electronic Publishing, one of the largest producers and distributors of CD-ROM titles. He says that the average PC-based CD-ROM owner has four to five CD titles. That's an amazing number, considering that CD-ROMs are still high-priced. The number of titles is even higher if you bought your drive with bundled software. It's also higher for the average Mac owner, who has six to seven titles. Cinnamon reports that some CD-ROM enthusiasts on his customer list have in excess of 15 CD titles.

We're on the verge of a huge upswing in the number of available CD-ROM titles, and prices are beginning to come down. Once again,

that's both good news and bad news. Each ROM puts a huge body of data at your fingertips. But thanks to that enormous capacity, you can't load the whole CD onto your hard disk. So when you want to switch applications, you do the CD Shuffle. You quickly wind up with a desk littered with CDs in their carriers: *Microsoft Bookshelf*, *Computer Library*, an encyclopedia, a couple of multimedia applications, a disk full of clip art, another of fonts.

MULTIPLY AND CONQUER

In practical everyday business use, one solution has been to put multiple CD readers on a file server, so that they can be shared by many people. I can recall when one of our servers at PC Magazine Labs had two readers. It gained another, then another. Now it has six. Some drawers are always filled with reference disks that we all use, while others host a variety of new disks that we try out. The popular ones stay with us.

Things can get a little slow if two or three editors are hammering on *Computer Library* at the same time, but it sure beats thumbing through back issues of *PC Magazine*. This LAN solution is great in the corporate setting,



where the cost of multiple drives is distributed over many users. But what's an individual user to do? You've invested in your productivity by buying a faster machine, a laser printer, and more memory, but you can't break the one-CD-at-a-time bottleneck.

THE JUKEBOX SOLUTION

Pioneer has come up with an interesting solution: the DRM-600 Minichanger, a six-CD changer. (Winn Rosch reviewed this product

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CIRCLE 727 ON READER SERVICE CARD

Bill Machrone

in First Looks, April 30, 1991, page 50.) Early models of the DRM-600 were slow, making them unsuitable for multimedia applications, which require a steady 150K-per-second data rate for proper performance. A recent ROM change in the unit brings it up to acceptable levels. The access time, at 600 milliseconds, is about half as fast as the fastest available and marginally slower than the typical CD-ROM drives, which clock in at 500 ms. But it holds six CDs, and that's pretty wonderful. It takes 6 or 7 seconds to switch from one to another, which is faster than you can change disks by hand. Each disk is its own drive letter, which is handy for most purposes.

The unit, however, is a monster, 4.5 by 8.3 by 15 inches (HWD). And while the Minichanger has come down in price from its original \$1,500 price tag, it's still not cheap. That's not bad when you consider that it's holding more than 3 gigabytes of data, but it still may have cost more than your computer. Cinnamon points out that this is the first product of its kind, not the last. We're likely to see enormous progress in this new product category, with multidisk players becoming smaller, faster, and less expensive. He's right, of course, and I can't wait to get the same capability in an internal drive.

NEVER SATISFIED

The CD is a marvel of compactness, but small as it is, it's playing hob with the design of desktop computers. Just as we were getting to really small footprints and diminutive form factors, along comes this 8-centimeter disk that only fits into a 5.25-inch slot. There's no hope of ever cramming one into a notebook machine; about the best you can do is have a wire running to a portable CD player that you leave in your briefcase or place on the table next to you. There also seems to be little hope for the 300MB 5-cm. CD format. It hasn't done well in the music market, so production facilities are limited.

I'm as big a CD fan as you can find. I just wish the clever folks who invented the CD had a little more than music on their minds when they laid down the design. If it had been designed first and foremost as a data storage medium, it'd be faster, it would hold even more data, and it might be significantly smaller.

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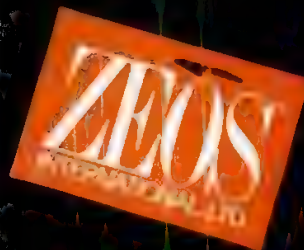
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John C. Dvorak



The Measure Of Success In the PC Decade

What did it take to succeed in the first decade of personal computing? Hindsight knows best. Look at the win-loss column of the score board.

What's happened in the ten years after the PC revolution? The big winners of the decade will make terrific case studies for business schools someday. The winners all scored high in five activities: 1) marketing, 2) dedication, 3) timing, 4) ability to change, 5) ability to take advantage of opportunities. The companies that did well in all five departments did the best. IBM, Microsoft, Borland, and Compaq come to mind. Unfortunately, while superior technology was important, it was not a key ingredient for success.

The most important of the five criteria for older, pre-PC companies was the ability to change. The old CP/M computer makers just didn't adapt fast enough to the new order. Names like Northstar, Cromemco, Morrow, Polymorphic Systems, and countless others simply faded into oblivion. Tandy and Zenith were

the only hardware makers that moved into the new personal computing era without much difficulty, as did Microsoft and Ashton-Tate on the software side.

Digital Research Inc. is a company that managed to change, but failed on the "ability to take advantage of opportunities" check box. Even though DRI was the dominant force in operating systems at the start of the decade, it couldn't close the deal for the IBM PC operating system and lost to Microsoft. Bill Gates scored high in all five categories and became a rich man.

Another winner was IBM (of course), which scored high on timing. IBM's Personal Computer opened up memory space and introduced 16-bit computers to the mass market at a time when the world was stalled at 64K of memory and 8-bit processing. When it discovered it had a tiger by the tail, IBM showed an aggressive ability to change, strong marketing, and dedication to the product, as did all the successful PC cloners. The same opportunity was there for the guys making CP/M comput-

ers, but most of them missed the boat.

The first PC decade was also earmarked by hardball marketing. In the software arena, Lotus, WordPerfect, Autodesk, and Borland are four winners that come to mind as super success stories. Each made its way to the top by recognizing the value of high-quality marketing and by taking advantage of an opportunity or two. Sheepish marketeers, afraid of advertising to the hilt, lost.

Intel was a big winner mostly because it had good timing and took advantage of opportunities. It invented the microprocessor but was in danger of losing its early lead to Motorola, Zilog, and Texas Instruments. IBM's adoption of the 8088 for its PC was the windfall opportunity that catapulted Intel to the front of the microprocessor world, a lead that it aggressively defends to this day.

The losers are harder to find since most of them lost early, faded into oblivion, and have been forgotten. Software companies such as VisiCorp went berserk during the CP/M-to-DOS transition and spontaneously self-destructed just at the point where incredible riches were about to be dumped on them. VisiCorp was completely unable to take advantage of



ILLUSTRATION: NED SHAW

opportunities; it also had a total lack of dedication. The principals were more interested in ego gratification than market share.

Take a good look at your favorite companies over the past decade and see how easy it was to predict failure or success based on the five parameters of success—especially in hindsight. The next ten years might be completely different, but one thing is certain in 2001: Hindsight will continue to rule.

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Inside Track

Engineers are wondering what Intel is **trying to pull** with the **486SX chip**. Most of the technology newsletters have taken **critical positions** regarding the 486SX. The 486SX is an honest-to-gosh 486 chip running at 20 MHz with the floating-point processor **disabled**. If you want a floating-point processor, then you buy a 487SX chip. The 487SX is also an honest-to-gosh 486 chip with an extra pin added to be **incompatible** with the normal 486 pinout.

With a loaded 486SX system you end up with **two actual 486 chips** that have been **phonied up** for marketing purposes. With both installed only one works. John Wharton, commenting on this **dubious scheme** in the *Microprocessor Report*, makes this snide remark: "Suppose someone had predicted years ago that by 1991, most midrange PCs would contain two—that's right, two—1.2 million transistor processors. Would anyone have guessed that the only new capability of the second CPU would be the ability to turn off the first?!" Wharton even says that as far as anyone can tell these are **actually 25-MHz chips**, too! My advice: **Buy a real 486**.

The Plot Thickens Dept.: So what's really going on here with the 486SX? Some people like to think that this is just a way to **attack** the 40-MHz AMD chip. The 486SX is called the **AMD killer**. But when you talk to enough people, this may just be a **smoke screen** for another development. There are reports that the 50-MHz version of the 486 may not ship this year. Apparently the 486 is **so fast** and complex that peculiar timing problems are **rumored to be appearing** in the current design at the 44-MHz barrier.

Meanwhile, Intel showed a **new 100-MHz 486 design** at this year's International Solid-State Circuits Conference. It's believed that the higher-speed versions of the 486 will have to be based on the new engineering. The most **paranoid observers** feel that this technology will go into the **586**, which will be rushed to the market in anticipation of the next generation of fast RISC chips (especially the one from M.I.P.S. to be used in a Compaq computer). If so, this leaves Intel with **one meager generation** of the 486 chip. So with the 486SX, Intel is trying to find **ways to recoup** R & D dollars before moving to the next-generation microprocessor.

The 586 is expected to have more on-board RISC, more functionality, better memory management, and a 16K write-back cache. IBM is said to have samples already and is expected to be the first vendor to show a 586 machine. The other company that may be first might be Dell Computer Corp. Michael Dell testified on behalf of Intel in its trademark suit

against AMD over the 386 moniker saying that his customers expected to find an Intel 386 inside the Dell 325. Dell testified that the number "3" meant Intel as far as he or his customers were concerned. The lawyers tried to make Dell say that he was testifying because he made some sort of **sweet deal** with Intel for a future consideration. He wouldn't admit to that, but **don't be surprised** if Dell isn't one of the first out of the chute with a 586 machine.

Market Stompers Dept.: Nintendo is the name of the company. Market penetration is their game. This company dominates the home video-game market, but it now sees the **opportunities** in the desktop and home computer market.

Like a lot of technology writers, I like to point out the **pathetic failure of American companies** to hold on to a market that they invented. A good example is the Xerox copier. I, like many of the readers out there, have a Canon copier in my home! Why don't I have a Xerox machine? They don't have anything to sell me, that's why.

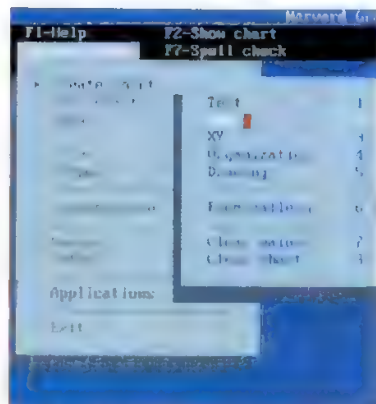
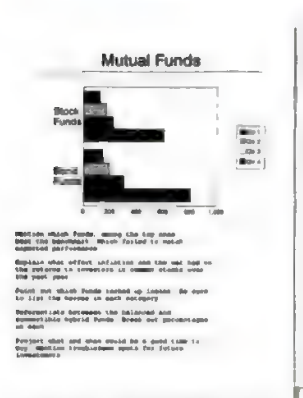
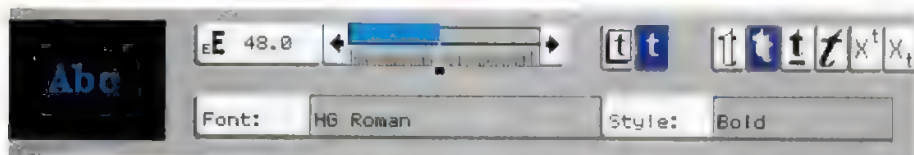
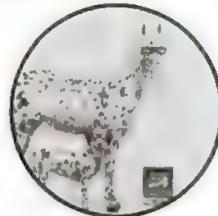
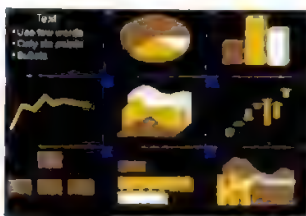
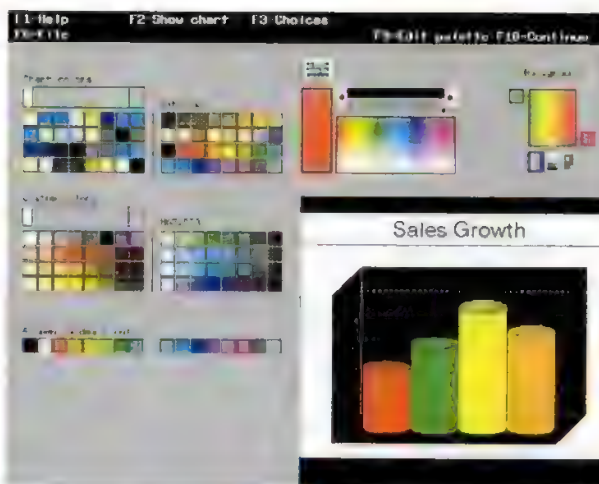
But, perhaps, the **biggest blunderer** is Atari—the inventor of the home video game. Nintendo now owns that market. It was abandoned by Atari. Nintendo has grown so fast that it needs to find new markets to exploit. Look for it to introduce a **CD-ROM version** of its new 16-bit game machine. The box will be first test

marketed in a **joint venture with Sony** later this year, then appear with the Nintendo label next year. It looks like this will begin as a **grandiose game machine**, but insiders expect to see a keyboard coming from Nintendo too. Next thing you'll see is *Lotus 1-2-3-N*.

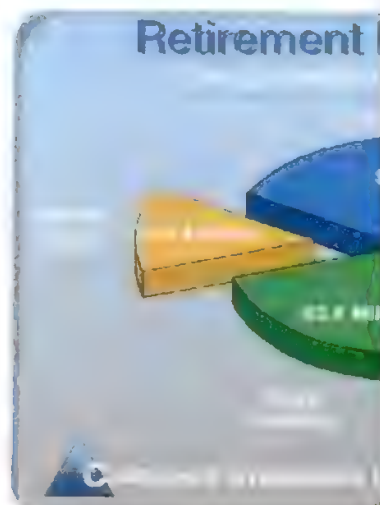
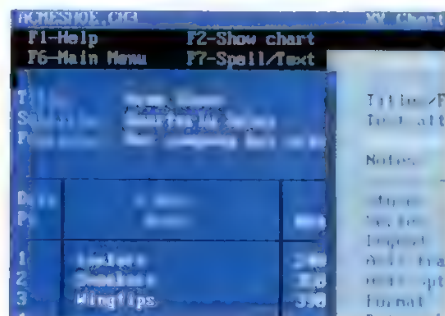
Setting New Laptop Standards Dept.: I've told laptop vendors that I'm personally not looking at any notebook or laptop machine that weighs over 4.5 pounds. Why bother? The new leader in this category looks like the **Commax 386 Ultrathin**, containing a 20-, 40-, or 60MB hard disk and an outstanding VGA screen. If you need a **lightweight 386**, then call the Fremont-based company at 415-435-5000. The 40MB system sells for \$3,295. By the way, the hard disk in this thing—a Conner Peripherals—is eerily silent.

Meanwhile: At Fall Comdex expect to see **Fujitsu** jump into the fray with a **2- to 3-pound featherweight notebook** based on the Poquet technology. This machine will make use of the new standardized **plug-in memory cards**. Let's hope the keyboard is usable. And for 486 users, the Notebook Computer Company of Houston (713-651-0800) is readying a 4.5-pound 33-MHz 486 in the same case used by Compu-Add, Sharp, and the TI TravelMate. It should be **hot!** ■

I like to point
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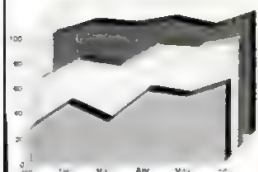
Coffee Table Books Semi-Annual Sales

Source: [Fairy Book Magazine](#), Fall 1994.

Overwhelming evidence is more than just

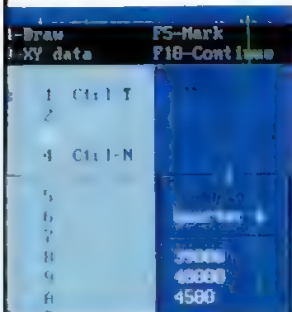
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Office Table Books Semi-Annual Sales

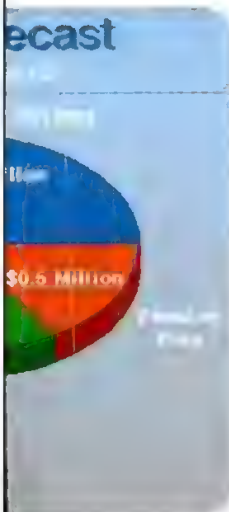


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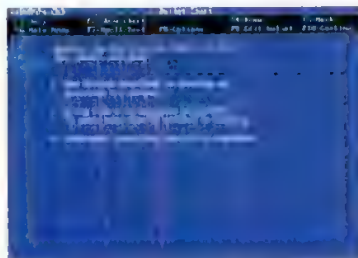
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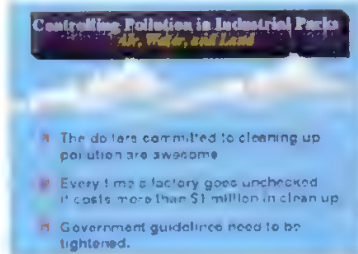
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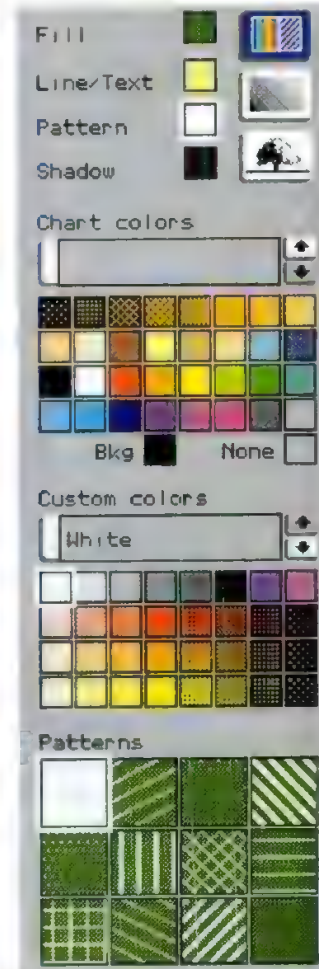
F9: Jump to

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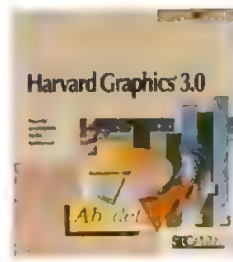
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Jim Seymour



PCs and Privacy Issues

PCs and today's computer technology are being blamed as the principal violators of personal liberties and the right to privacy. It's time to set the record straight.

I've been out on the publicity trail lately, flogging my new book, *Jim Seymour's PC Productivity Bible* (A Brady Book, Simon & Schuster). One stop was "The Today Show" on NBC.

The topic of the morning was computers and privacy. Mark Rotenberg—the head of Computer Professionals for Social Responsibility's lobbying office in Washington, D.C.—joined me; we were supposed to debate, in the loosest sense of that term, the notion that misuse of computers is eroding our right to privacy in this country.

Television talk shows inevitably produce a lot more heat than light, so I doubt that Mark or I changed many people's minds. But despite the tendency of television to trivialize things, this is a genuinely important issue, and one I think all of us need to consider.

PC Magazine's readers are not just near the forefront of the reshaping of our culture through empowering people with computers—you are the forefront. As the opinion leaders and shapers, society looks to you for clues on what's important and which threats are real and which aren't as we enter this strange new age.

So I think we should talk about privacy and PCs calmly for a few minutes, away from the glare of studio lights and the urgency to hurry along to Willard Scott's next weather report.

It seems to me that there are four ideas important to keep in mind in computers-and-privacy questions.

The first is simple: It isn't the *technology* that's the villain here, but the people who may misuse it. The computer is simply a tool—albeit a very powerful one—for these people. If they have malicious inclinations, those inclinations existed long before PCs came into the picture, and will find expression with or without them.

So privacy isn't a "computer problem," but a human and societal one, amenable to exactly the same kinds of remedies we apply to other societal problems.

Second: Let's keep it in perspective. While privacy issues are important and worth discussing, there are more-pressing items on our

national agenda. Even within the privacy arena, there are issues far more critical than "computer privacy" questions—the practice and ethics of random drug testing in the workplace, for example.

Alan Westin, a Columbia University law professor and privacy expert with an unimpeachable background in protecting individuals' rights, says it well: "Privacy advocates have been so busy fighting for privacy that they don't always realize that the most this will result in is an extra bit of junk mail."

Thank you, Professor Westin.

OURSELVES TO BLAME

Third, keep in mind that computer-privacy issues—which almost always revolve around credit bureaus and mailing-list resellers providing names and addresses of target groups to marketers—are already within our individual control. *If we don't provide the information*, it can't be assembled, collated, and sold by Equifax, TRW, and Trans Union Credit Information, the three giants in the reporting business, nor by the dozens of smaller, more-specialized outfits.



Far too often, we blindly fill in all the blanks on the forms we're presented by everyone from health care providers to grocery-store checkout clerks. If we were more skeptical about why a given entity needs a certain piece of information, and why *any* of this information is needed for most transactions, we wouldn't be filling up the databanks with information we don't want in circulation.

Does your dentist really need your social security number? Is the convenience of having

Jim Seymour

a check-cashing card at the local "Shop Till You Drop" really worth divulging your whole credit history? Maybe so... but like the genie out of the bottle, once you've given out that information, it's awfully hard to stuff it back inside.

For years I've simply left blank the spaces on forms I thought inappropriate to complete. About two-thirds of the time, those blanks are ignored. When, in the one-third of the cases where someone points out that I "overlooked" some things, I ask them why they need that information.

I get stunned responses. "Oh, I don't know... it's just there on the form, I guess" is the most common. I tell people that if they can explain to me why they need the information, and I agree that it's a good idea, I'll provide it—but otherwise, it's none of their business.

And I can't recall a single incident, in 20 years, when I was refused whatever I was seeking simply because I didn't fill in every blank on the form.

Fourth and finally, we should remember that there are real benefits to the rapid availability of some kinds of information. We like to have our credit-card purchases approved quickly, even when we're buying big-ticket items. We want loan applications approved while we wait. We want to be able to cash checks anywhere, anytime. None of that would be possible without large-scale centralized databanks.

THE WILL OF THE PEOPLE

The current flurry of interest in computer-privacy issues has been driven in large part by the dust-up over Lotus's decision to cancel its high-profile CD-ROM product *Lotus Marketplace: Households*. With name, address, and "lifestyle profile" data provided by Equifax on 80 million American households, *Marketplace* would have leveled the field, bringing to smaller businesses precisely the same mailing-list services now available to larger businesses.

Well, not exactly. *Marketplace: Households* was far more circumspect than the reports and lists you can buy from the big market-data firms. Lotus and Equifax showed a civilized respect for our privacy, for example, by not including telephone numbers, individual ages, credit histories, income, and so on. And you

couldn't look up information on a single individual or family; names and addresses appeared only in blocks of households selected according to broad criteria.

Yet Rotenberg and his CPSR colleagues helped start a firestorm of complaints to Lotus about the product. By the time Jim Manzi announced that Lotus had decided to kill *Marketplace* at the last minute, more than 30,000 people had written Lotus to complain about this assault on their privacy.

What assault?

Personal computers are today leveling the field across the board in business, empowering individuals and small businesses in ways that let them compete effectively, and fairly, with the big boys.

It's sad when a misplaced and misinformed concern over privacy interrupts that fundamentally democratic and egalitarian process.

COMPUTER PRIVACY OR JUNK-MAIL GENOCIDE?

If all this is a little depressing—if you're as appalled as I am by the nonsense being handed out in the guise of raising legitimate public concerns—then you'll love what the privacy extremists have coming up next.

They want to set up a system whereby names could never be put on a mailing list being provided by a business to another business unless each person on that list was contacted and his permission received for inclusion on *that specific list*. Privacy crusaders complain that today's system—which allows anyone to opt out of inclusion on *all* lists by sending a postcard to the Direct Marketing Association—is a cruel and unfair burden. What we need, they say, is an "opt in" system, where I suppose we'd call and say, "Yup, gee whiz, I sure want to get some more junk mail, so would you please put my name on a bunch more of those lists?"

(If you want to get off lists, just send a card or letter with your name and address to the Mail Preference Service, P.O. Box 3861, New York, NY 10163.)

Actually, there's another step beyond that: Some of the privacy people want us to be paid each time our name is put on a list. They think a nice little royalty—say, five cents—would be fair.

If it sounds to you as if these efforts are a little tongue-in-cheek—that the people behind opt-in systems and the notion of

per-use royalties for our names and addresses aren't serious but rather are attempting to kill an industry by loading unbearable burdens on it—well, you're right.

I think it's clear that this is an effort less to change from one approach to another than simply to bury under untenable regulation a system some people don't like.

I have no love for the mailing-list people; it wouldn't break my heart if I never got another piece of junk mail. But I hate to see public policy shaped by demagoguery. And I think describing all this as a "computer privacy" issue profoundly misstates the case.

It cheapens public dialogue, and worse, it distracts us from addressing real privacy issues, computer-related or not. I'd like to see us worry more about things like undisclosed company monitoring of employees' supposedly private e-mail messages. Or the actions of the federal officials who stomped through the offices of Steve Jackson Games, grabbing every PC and disk in sight, virtually putting the company out of business—because an employee of the company was being investigated.

Instead, an assault on the junk-mail business and on direct marketers has been cloaked in the guise of a "computer problem." That's like those obnoxious tire commercials that show a woman driving a station wagon full of kids, skidding along a narrow, twisting mountain highway at night in a driving rainstorm: scare tactics, pure and simple.

These days, "PC" has come to mean "politically correct" as often as it means "personal computer." And it's not "PC" to question alleged assaults on our privacy. Privacy is Good; to question its apparent defense is Bad. But political correctness isn't worth forsaking reason and facts in public policy.

As opinion leaders on computer issues in our society, *PC Magazine's* readers need to reach their own conclusions about real versus imagined "computer privacy" issues. And, when asked, to stand for reason and use facts to help shape that debate. Not because we use PCs and are worried that our lives may be made more difficult by misguided regulation. But because as citizens we have priorities beyond political correctness, and an obligation to speak up when an area in which we have knowledge is brought into the national political dialogue. ■

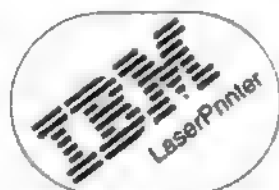
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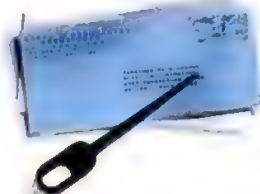


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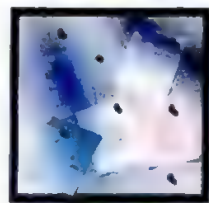
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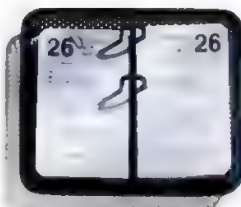
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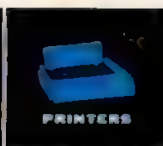
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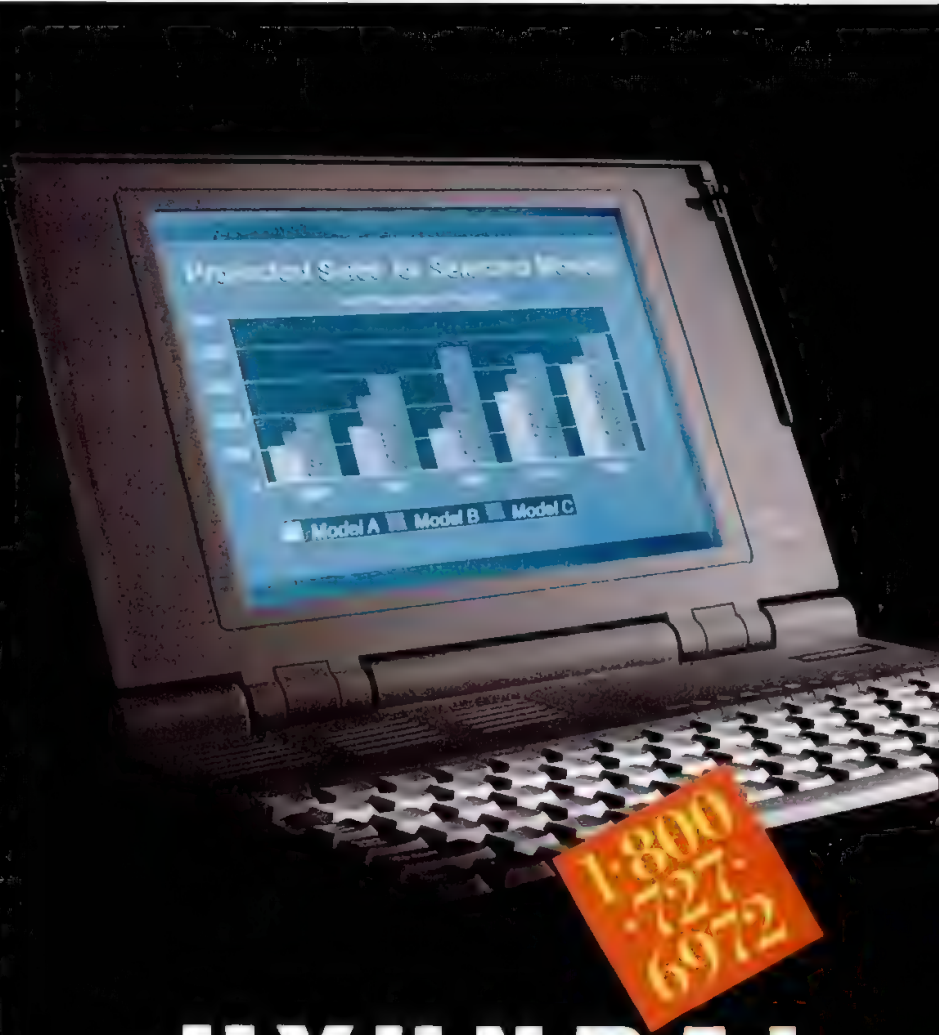
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INFORMATION SYSTEMS

William F. Zachmann



Education: The Final Frontier

If you think PCs radically changed business in the eighties, wait until you see what happens to education in the nineties.

Computers will ultimately have their greatest impact on education, and that impact may be very different from what some experts expect. We may see nothing less than the total destruction of the educational system that has dominated human learning since the earliest days of civilization.

This far-reaching change in our educational process could be the most dramatic impact of information technology on human life in nearly three thousand years. Such a far-reaching change could radically alter not only how we learn but also what we learn.

The last technological innovation of comparable importance was the adoption of the Phoenician script by the inhabitants of the Greek peninsula nearly three thousand years ago. The writing system of the Phoenician traders, which the early Greeks borrowed, was based on a direct relation between the individual sounds of the spoken

language and the marks used to represent them. This information-technology innovation was crucial to the formation of what ultimately became known as Western European civilization. Our basic concepts of the individual and society, of the citizen, of democracy, of philosophy, and of science all owe much to that crucial innovation.

The pictographic writing of earlier major civilizations was necessarily the domain of specialists. Egyptian hieroglyphics, Mesopotamian cuneiform, Chinese characters, and other similar systems required memorization of thousands of individual symbols. Only able individuals, intensively trained, could master the written language.

Adoption of the Phoenician traders' script as a general means to represent the spoken word was a crucial step toward the emergence of modern civilization in classical Greece in the sixth century B.C. It made widespread (though of course not yet universal) literacy possible. Without the ready access to information provided by the easy-to-learn information technology of phonetic script, the Athenian concepts of the free citizen and of democracy

would not have been possible. These, in turn, became the formative matrix for modern civilization as we know it.

Like pictographic languages, modern electronic digital information technology remained the domain of specialists in its earliest era. For the past 40 years, traditional mainframe and minicomputer systems were tended by information systems professionals in the air-conditioned, raised-floor temple of the computer center.

The microprocessor revolution changed all that. Like the transition from pictographic to phonetic script that led to the Greek classical era, the transition from traditional to microprocessor-based systems puts a crucial new information technology into the hands of the multitude. The first stage of the microprocessor revolution was the personal computer as an individual productivity tool. That is really what the personal computer explosion of the 1980s was all about.

The second stage is now underway. It amounts to the replacement of traditional mainframe and minicomputer systems—based on proprietary architectures—with effectively standardized microprocessor-based systems. That is our primary agenda for the early 1990s.



But the most critical stage of the microprocessor revolution hasn't even begun yet. It will occur later this decade, as the power of computer technology is directed toward helping people of all ages learn all sorts of things.

Elements of this are already evident in numerous (if still primitive) forms. These, of course, include all sorts of "educational" software, from the earliest and clumsiest ef-

William F. Zachmann

forts at "computer-aided instruction" (CAI) to the latest and slickest educational programs or games.

Some of the most interesting early forms are ordinary games that sometimes have more real educational value than

games that are intentionally educational. Simulation games ranging from the realistic (like Microsoft's *Flight Simulator*), to the more-or-less fanciful (like Maxis's *SimCity*) are good examples of ordinary games from which one also learns.

Other fascinating precursors include products like BibleSoft's *PC Study Bible* (which includes numerous translations and an optional concordance and Greek and

Hebrew dictionaries) and PC Globe's *PC Globe* (an excellent computerized atlas).

Another example is provided by Microtac Software's *French Assistant*, *German Assistant*, *Italian Assistant*, and *Spanish Assistant* translation programs. These are helpful not only for translating, but also for learning the languages. Electronic reference works like Encyclopaedia Britannica's *Compton's Multimedia Encyclopedia* represent yet another aspect of what computers can do in the educational realm. Indeed, much of what falls under the heading of "multimedia" has obvious educational potential.

Numerous as these examples may already be (and I have literally mentioned only a few that came immediately to mind), they are no more than indications of what is yet to come. Even the most sophisticated educational or game software today is little more than a primitive hint of what will be possible a few years down the road.

There are three real keys to unlocking the educational potential of modern computer technology, and all three will be in place by around the middle of this decade. The first is the sufficient maturation of the underlying technology to make what we've recently called "multimedia" widely affordable. The second is the devotion of sufficient resources to create truly educational software on a broad basis. The third is the development of a sufficiently large market for educational software via individual consumer purchases—independent of established educational institutions.

The first will happen simply through technological development and market competition. The second will be a result of expanded opportunities for financial reward as a consequence of the third. Thus, the third key is the most critical.

The key to unlock the box that holds the crucial third key is a simple realization: The path to education must be by way of entertainment. To learn is ultimately the most entertaining thing a person can do.

To make learning entertaining or, better put, to make entertainment educational is the key to successful software that will tap the full educational potential of microcomputer technology. Developing such software will require the best and most capable minds of the educational community. It will require the most talented minds of the entertainment world as well. It is likely to be one of the most exciting challenges of the present decade. ■

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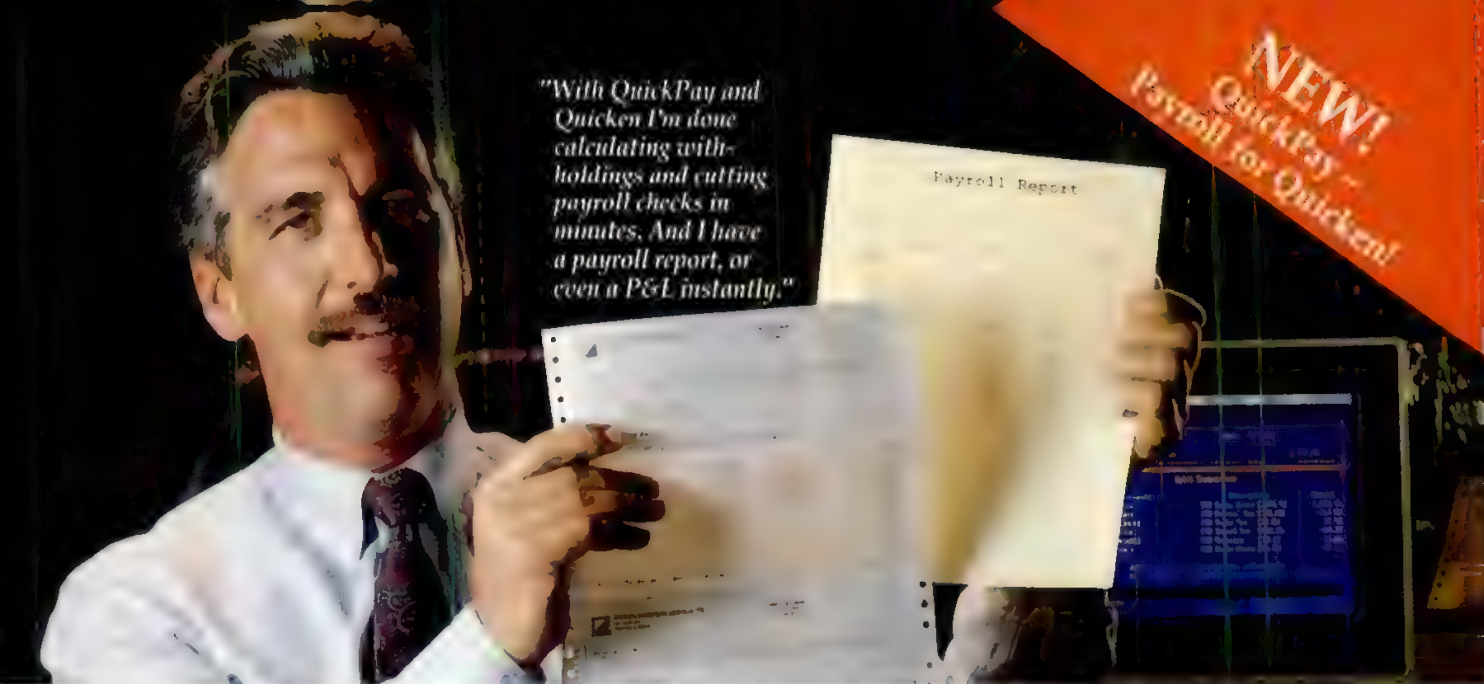
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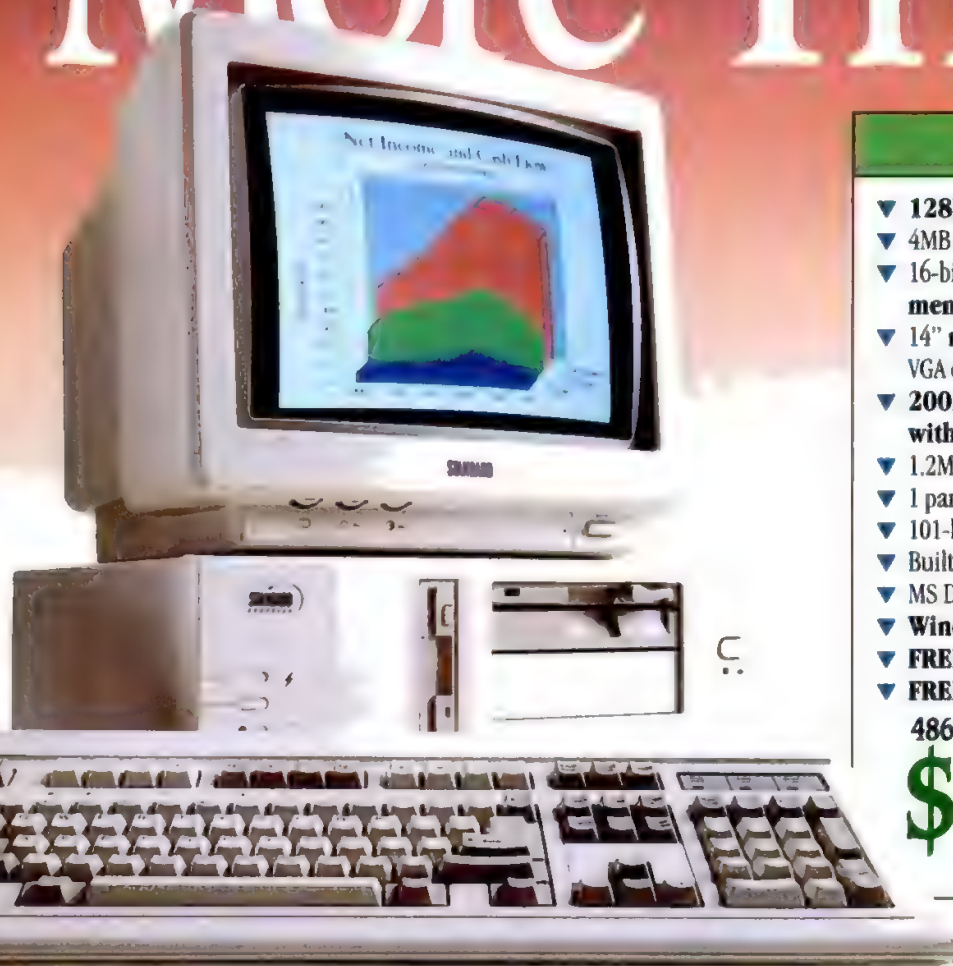
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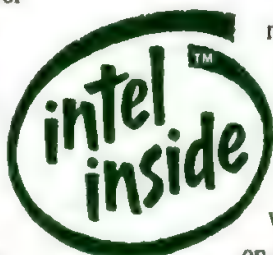
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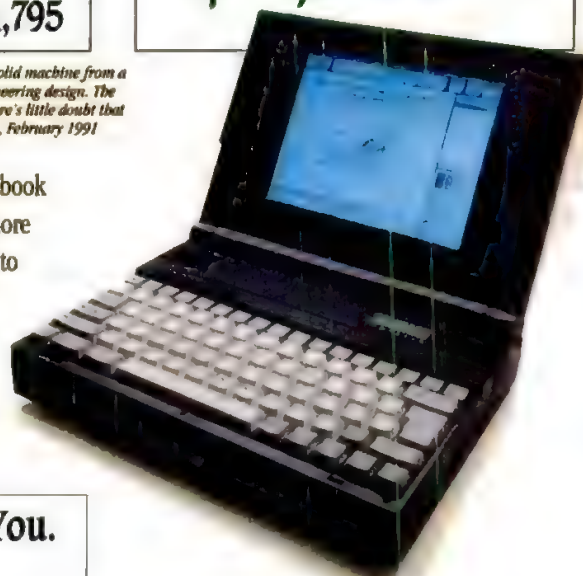
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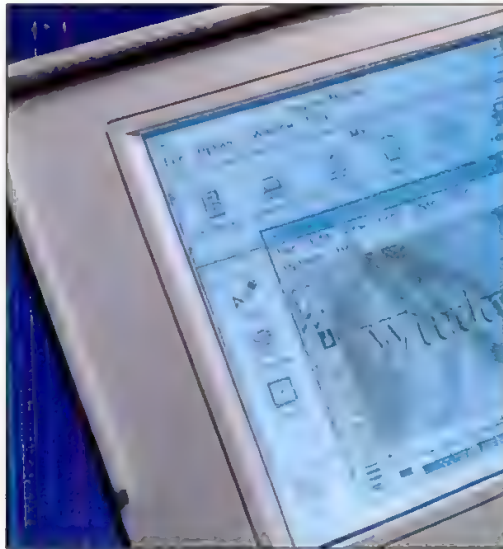
CIRCLE 304 ON READER SERVICE CARD

386SX Laptops:

Desktop Power Notebook Size

IN THIS REVIEW

ALR Venture/16
 AST Premium Exec 386SX/20
 Automated Computer Technology Tempo 386SX
 Bitwise 386SX/16 Notebook
 Commax Notebook 386SX
 Compaq LTE 386s/20 Model 30
 CompuAdd CompanionSX
 Dataworld NB-320SX
 Dell System 320N
 Epson NB3s
 Everex Tempo LX
 IBM PS/2 L40 SX
 Leading Technology PC Partner XL
 Micro Express NB5620
 Micro Telesis NBA386SX
 Modern Computer Walkom NP-903
 NMS 80386SX/16 Notebook
 Northgate SlimLite
 Samsung NoteMaster 386S/16
 Sanyo MBC-18NB
 Tandon 386SX-20
 Tangent 320N
 TI TravelMate 3000
 Toshiba T2000SX
 Twinhead Supernote 386SX
 Veridata Execulite 386S
 Zeos Notebook 386



by Jim Seymour

Windows to go. That's the promise offered by this latest batch of notebook PCs—the 386SX generation. Sure, there's value here for the plain-DOS adherent. But for most PC users picking up one of these 6- to 8-pound wonders, what will catch your eye is the machine's potential to take *Windows* off your desk and with you when you travel.

But if that's *all* you see in these boxes, you're missing the larger reward: Finally, we've got portable PCs capable enough to be your *only* PC.

Until now, portables have trailed the most widely used desktops by a technological genera-

**They're fast enough
 for Windows, light enough
 for travel, and even the
 keyboards aren't too bad.
 PC Labs tests 27 16-MHz
 and 20-MHz 386SX notebooks.**

tion or two. The 8086 and 80286 lap-portables that dominated the market until the last few months were at least a notch too slow—and usually too compromised in terms of hard disk size and performance, keyboard touch and display quality—to be serious candidates for replacing the desktop machines that were our primary PCs.

Indeed, as long as portable PCs had that “second PC” reputation, they were a hard sell to management. You had to really *need* computing on the go to economically justify two-PC status.

Worse, the agonies of living with two PCs—simply put, the latest version of

everything you needed was always on the other machine—meant you had to really *want* computing on the go to put up with its inconveniences. We argued at length about whether file-transfer programs such as *LapLink* and *The Brooklyn Bridge* were sufficiently convenient to make a built-in floppy disk drive unnecessary—when the real issue was why we should put up with shuttling those files back and forth in the first place.

The two-PCs problem was a classic business and technology conundrum: a problem with no evident solution.

But now these new 386SX notebooks are finally resolving that problem and crossing the line—if in some cases, only barely—for many of us: Now we can use one PC, which just happens to be highly transportable, for all our work.

Keep a color monitor on your desk, and maybe a Xircom PocketLAN adapter, and your deskbound computing isn't seriously compromised. Unplug the monitor cable and the network adapter, attach a mini-trackball if you want one, and you're ready to hit the road, your programs and data intact and up to date.

So *Windows to go*, as powerful and seductive a notion as it may be, is really only part of the incredible value offered by these machines. The other part of the equation is price: With recent price cuts by market leaders such as Compaq and Toshiba, owning a 386SX notebook no longer has to set you back \$5,000 or more. Compaq's April price reduction set in motion cuts by Dell, IBM, Texas Instruments, Toshiba, and others—though the vendors are now putting the squeeze on dealer margins. Compaq's 40 percent dealer discounts are a thing of the past, and other vendors have adopted similar strategies.

AVOID THE SWITCH

Economic considerations aside, you can't diminish the importance of making *Windows* portable. If you've gotten used to working at your desk by pointing and clicking, or having your PC come up with several programs open and ready to work with, or switching among those programs in just a couple of seconds, you're not going to be very happy about reverting to the cold, cruel world of unadorned DOS when you travel.

And if you've made a commitment to, say, *Microsoft Excel*, *Lotus Ami*, and *PowerPoint* on your deskbound PC, you're going to have a hell of a time running the files you've created with those *Windows* applications on a DOS-only laptop. Even with programs that read from and perhaps write to other programs' file formats, it's hard to reprogram your *fingers* to move between two different programs in the same category.

And *Windows*' hefty hardware demands have pushed 286 notebooks to the edge, and beyond. Sure, the ads say you can run *Windows 3.0* on those machines. And yes, you can—even with only 1MB of memory in them.

But you won't want to. No one who's

386SX PORTABLES: RECENT REVIEWS

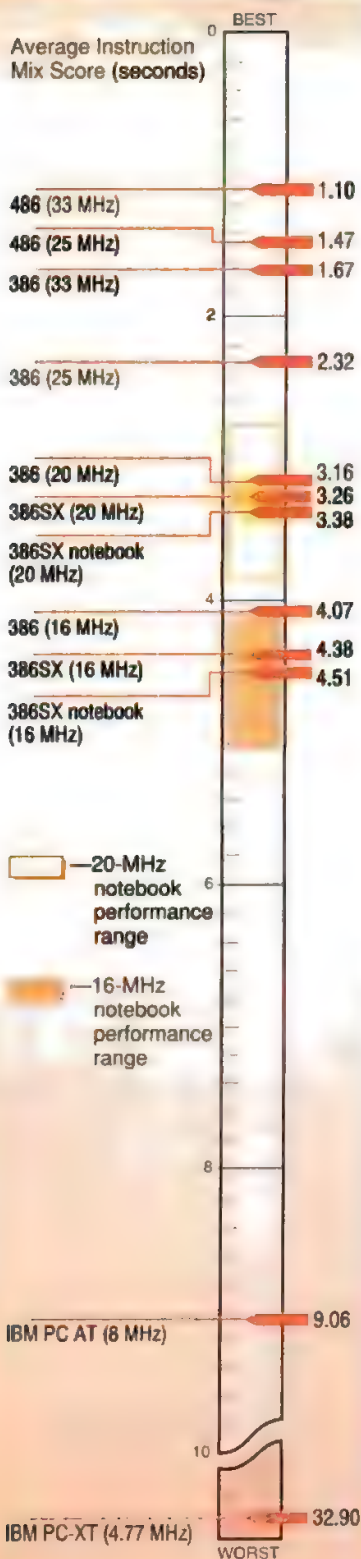
Model	Price of standard configuration	80386 Instruction Mix test score (seconds)	Battery	PC Magazine review (issue date and page)
MARCH 12, 1991				
Acer AnyWare 1100LX	\$4,215	4.39	■	114
Bitwise SportSX	\$2,995	4.39	■	115
Bus LT-386sx	\$2,764	4.39	■	116
Commax Excell LT-386SX	\$3,290	4.86	■	117
PC Compaq LTE 386s/20 Model 30	\$6,649	3.09	■	117
Compaq SLT 386s/20 Model 120	\$7,649	3.10	■	122
CompuAdd 316SL	\$2,895	4.39	■	125
PC Dell 316LT	\$3,399	4.38	■	129
PC Dell 320LT	\$3,999	3.50	■	129
Fora LP386SX Model 70/20	\$4,699	3.41	■	132
GRIDCase 1550sx	\$6,345	3.57	■	139
Hyundai Super LT5	\$3,995	4.39	■	142
NEC ProSpeed SX/20	\$6,198	3.43	■	153
Network PC Intra LT-386SX	\$2,499	4.39	■	158
Peregrine Sport SX	\$2,699	4.39	■	162
Sharp PC-5741	\$5,495	3.78	■	162
Tangent Model 316L	\$2,768	4.39	■	166
Tangent Model 320L	\$2,890	3.41	■	168
PC Toshiba T3100SX	\$5,699	4.39	■	178
Twinhead SuperLap 386SX/20	\$3,575	3.84	■	180
OCTOBER 16, 1990				
Arima ACT 386SX-420	\$2,995	4.37	■	142
PC Compaq SLT 386s/20	\$6,799	3.11	■	144
Data General Walkabout/SX	\$5,395	4.34	■	148
Epson Equity LT-386SX	\$5,598	5.03	■	151
GRID 1450sx	\$7,483	4.35	■	157
Impulse SX	\$3,395	4.54	■	162
Intelligence Technology 386 PEP	\$4,244	4.89	■	167
Twinhead Superlap SX	\$4,095	4.32	■	175
MARCH 13, 1990				
Dataworld Data LP/SX	\$3,195	4.61	□	114
Dauphin Crown SX	\$4,995	4.46	■	126
Micro Express Regal SX	\$2,774	4.26	□	153
National Micro Systems Gas Plasma 386SX-16	\$2,749	4.33	□	159
NEC PowerMate Portable SX	\$5,999	4.58	□	160
NEC ProSpeed CSX Color	\$8,499	4.53	□	161
PC Brand 386/SX-16 Portable III	\$2,759	4.34	□	179
Toshiba T3200SX	\$7,398	4.67	□	183
Zenith SuperPort SX	\$6,799	4.71	■	190

—Editors' Choice ■—Yes □—No

Note: The same three issues of *PC Magazine* contain reviews of 80286-based notebook and portable PCs.



PROCESSOR PERFORMANCE COMPARED



used *Windows* in its 386 Enhanced mode ever wants to go back to either of its two more primitive modes ("real" and "standard") for anything except system-level chores. *Windows* is a creature of the 386 world—a 386-specific program in every rational way, if not in name—and running it on an 8088, 8086, or 80286 machine just isn't worth it.

And *Windows* demands a large, fast hard disk—rare as hen's teeth in earlier generations of notebook PCs. It wants to find 4MB to 5MB of RAM in your machine—pushing the limits of even the most expandable 286s notebooks. And it demands a large, bright, reasonably high-resolution VGA display—not the double-dot CGA and occasional EGA screens of earlier portables.

CONFIGURING FOR WINDOWS

Enter the 386SX notebooks.

For a premium of only a pound or two over the smallest and lightest 8086 and 80286 notebooks, and maybe another \$1,000 in real-world purchase price, you get to play in a league where roomy, fast hard disks are becoming the norm and sub-VGA displays are almost unknown. And where memory capacity isn't an issue any more: Among the machines we reviewed, most could accept up to 4MB or 5MB of RAM, and the Tandon and Dataworld accept up to 16MB. IBM's new entry, the Battleship Missouri...oops, the PS/2 L40 SX, can take 18MB.

Notebook PCs take only a slight performance hit compared with desktop systems that have the same processor and speed rating. Overall, the 20-MHz notebooks shave about 25 percent from the 16-MHz notebooks' performance times on our processor test. Desktop 386SX/20s show similar performance gains (about 23 percent) over 386SX/16s.

The 20-MHz 386SX laptops performed the 80386 Instruction Mix benchmark test in 2.76 to 3.84 seconds, while 16-MHz laptops had scores that ranged from 4.10 to 5.03 seconds. In both these categories, the range given encompasses the average score for desktops at each processor speed.

This chart shows speed differences between processor classes. We report the average Instruction Mix benchmark test score for the spectrum of desktop systems and for both 16-MHz and 20-MHz 386SX notebooks. The shaded areas represent the range of scores for 16-MHz and 20-MHz notebooks and laptops reviewed in this and previous issues of *PC Magazine*. This range may overlap with the average scores of one or more categories.

In sum, you can find a machine with specs very much like what you'd set out for an optimal *Windows* platform. Not to mention a very good desktop PC.

For our evaluation, we asked vendors for machines that met a standard configuration spec including 16- or 20-MHz 386SX microprocessors, 20MB or larger hard disks, 2MB of RAM, a total system weight under 8 pounds, and FCC Class B certification. Twenty-seven vendors submitted PCs (including the Compaq LTE/s20, a past editor's choice); another 16 companies—Acer, Acma, Aquiline, AT&T, Blue Star, Bus, CMO, Fora, Kris, Lan Technologies, LSE, MMI, NBCC, Ogivar, Polywell, and Premier—missed our deadline for review.

Where many vendors market the same box with a different label and a few different details, we review such systems together. ACT, Everex, Sanyo, and Zeos, for instance, all sell notebooks based on the same Sanyo motherboard; through the mail-order channel, CompuAdd is marketing Texas Instruments' TravelMate 3000 as the CompuAdd Companion. In such cases, you'll find one review, but individual test results and listings in our summary of features.

TOO MANY GRAY SHADES?

There are three areas of dispute over the suitability of 386SX notebooks as *Windows* platforms, as replacements for deskbound PCs, and as solutions for the two-PCs conundrum: display quality, keyboard quality, and expandability.

The long-gray-scale monochrome VGA displays of these machines are remarkable. Though a few (such as that of the ALR Venture) are a bit small, most have enough display real estate for easy use. And some—such as the Zeos/Everex/ACT/Sanyo machines, the TI/CompuAdd, Twinhead's Supernote, and the IBM PS/2 L40 SX—have truly large screens.

Display brightness is better than we've seen before, too. The Sharp-produced displays on some of these machines top the list, but many of these notebooks have bright, contrasty displays.

Gray scaling—and of course, the lack of color—is a more subjective area. While a larger number of gray-scale steps suggests a screen capable of showing very fine gradations—thus rendering a good translation of an application's color output—in many cases we found that a long-gray-scale display is a murky display. Showing many well-differentiated gray

steps is very difficult within the relatively narrow brightness ranges of these displays.

Indeed, a good argument can be made that fewer, not more, gray-scale steps contribute to a more readable display. When you carve up the brightness range of a typical sidelit LCD display into only four or perhaps eight steps, you get a much snappier, contrastier display. In some cases, just a two-step gray scale—black and white, on or off—can be desirable. Unfortunately, none of these machines makes it easy to adjust the number of gray steps that a built-in display adapter uses in converting a program's color output to the monochrome image on its screen.

It's too bad, also, that more manufacturers don't offer the normal/inverse switch for the display, like the one found on the TI and CompuAdd machines and in different form on the Dell 320N. Some users think, for example, that *Windows* and a few other graphical interface programs look better in inverse video.

The lack of color is simply part of the game. You can get color—bright, brilliant, maybe better-than-VGA-color—in a portable PC these days, of course. It's called the Toshiba T3200SXC, weighs 17 pounds, and will set you back a cool \$7,249. Oh yes: It runs only on AC power.

The weight, cost, and power requirements of bright, VGA-level color LCD displays will certainly drop. We'll eventually see displays like the one found in the T3200SXC in many lightweight notebook PCs. But not soon. The power requirement, especially, is formidable. And

Toshiba's T3200SXC display production yields are so low that it contributes about \$2,000 to the price of the machine.

So if color is really important to you—and many users (including the author) think that *Windows* is a poor bet in monochrome—then these SX notebooks aren't a good choice for you.

KEYBOARD COMPROMISES

Keyboards are another area of debate. Happily, most of the tested SX notebooks—save the Dell System 320N—have keyboards with standard, full-size spacing between keys; the days of the squeezed keyboard seem past, excepting only palmtop PCs. And the touch of notebooks' keyboards is generally good to very good.

But there are compromises. Most of these machines embed the Home, End, PgUp, PgDn, and numeric keypad keys in the alphanumeric portion of the keyboard; you have to hold down another key (usually labeled Fn) while hitting them to get the expected result. Also, check the placement of the Ctrl, Alt, CapsLock, and Backslash keys: They float all over the place in these machines.

And cursor key placement is still a problem. Compaq still hasn't figured out where cursor keys ought to go. The LTE 386s/20 displays the latest episode of Compaq's cursor shell-game: the clumsy L-shaped arrangement now sadly shared by some others in this group. For most of us, the more conventional inverted-T

cursor layout is a lot more logical and a lot easier to get used to.

Finally, if your definition of expandability is measured in slots, forget it: These are basically slotless machines. Most accept internal modems; all can be used with external network adapters through their parallel ports. All can be connected to external monitors and most to external keyboards; some even accept dedicated external numeric keypads.

But if you require conventional expansion slots, you won't find them among these sub-8-pounders. (External expansion units, sometimes called docking stations, do offer a solution; keep reading.)

CAVEAT EMPTOR

There are some not-so-obvious traps for the unwary when shopping for a notebook PC. After all, for most of us, this is a new category of computer. Here are some areas to consider:

Modem capability Most of these new machines will accept internal modems. External modems can be plugged into the others, but hauling around an external modem (and, perhaps, its AC-power transformer) can markedly increase the size and weight of your kit—as well as markedly decreasing the convenience of using a notebook. Yet modem-level connectivity is important in notebooks: For many users, these machines are largely electronic-mail terminals. Consider whether an internal modem may be a requirement, not merely a nice touch, for you. Then choose the options you want: send/receive fax, or perhaps cellular capability.



SYSTEM PERFORMANCE: A GUIDE TO THE GRAPHICS

BENCHMARK TESTS

The Bars

We created separate charts for 16-MHz and 20-MHz processors. Each colored bar represents the range of 16-MHz or 20-MHz test scores, from fastest to slowest. The longer the bar, the wider the range. If the best score is more than twice as fast as average, an upward-pointing arrow appears atop the colored bar.

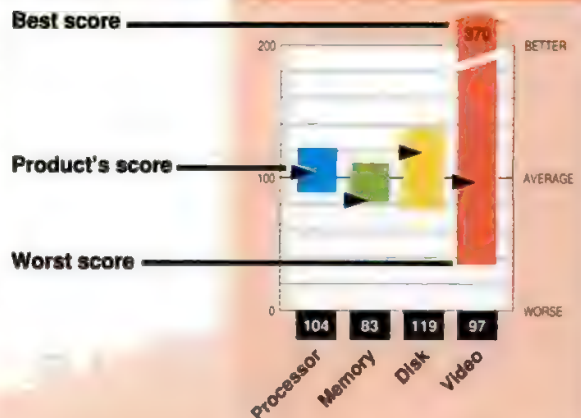
A black arrow on each bar represents a system's position within the range. The higher the arrow, the better the performance. If a system performs more than twice as fast as average, the black arrow appears at the top of the bar, pointing upwards.

The Boxes

A normalized score appears in the box below each colored bar. This number reflects the portable's position compared with others in its processor class. To derive this figure, we calculated the average score for all 45 portable 16-MHz 386SXs and for all 26 portable 20-MHz 386SXs reviewed in *PC Magazine*, March 12, 1991, October 16, 1990, and March 13, 1990. We then divided the average by the score of each machine in turn and multiplied by 100.

Thus the average score is 100; a number greater than 200 indicates that a system performed the tests in less than half the average time; a number smaller than 50 indicates the system took more than twice as long to complete the test.

A table of actual scores accompanies the three-dimensional bar charts.



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CIRCLE 104 ON READER SERVICE CARD

AT&T, whose highly-styled Safari arrived too late to be included in this roundup, promises a high-performance internal modem with both of those features coming in the fall.

Watch out for modem specs, too. You should expect a 2,400-bps unit that offers MNP 5 data compression and error correction. Modems with v.42 bis compression and correction on top of MNP 5, like the ones found in the Compaq, Samsung, and Zeos notebooks, are better still. Given the variability in phone-line quality encountered by business travelers, error correction may be even more important in a notebook than in a deskbound PC.

Hard-disk capacities The tiny 2.5-inch hard disks that made notebook PCs make sense are a relatively new product category and have been in short supply. Many manufacturers started with 20MB designs—like those of the first PrairieTek drives—but now also offer 30MB, 40MB, and 60MB, mini-hard disks from Conner and Toshiba, among others, as options.

If you're planning to run *Windows* on your notebook, you'll want to spend the extra \$250 to \$500 to get one of the larger disks. Install *Windows* and two or three of today's *Win 3* applications—each of which can take as much as 4MB to 6MB of space just for its program files—on a 20MB drive, and you'll have little space left for your data files.

You may see better performance, too: The larger, newer designs often offer 19-millisecond average access times, while the older 20MB units are usually 23-ms. devices.

Processor speed About half the machines we tested use 16-MHz 386SX chips; the others use the newer, 20-MHz version. While processor speed alone is not a guarantee of better performance—bus and memory speed, hard disk, and video adapter performance all contribute to the perceived speed of a computer—it's important. The 20-MHz machines ran about 20 percent faster, on average, than the 16-MHz designs in our tests.

You may well be happy with a 16-MHz model, but all other factors being equal, look for a 20-MHz machine.

Add-on memory cost We specified 2MB machines for our tests—the minimum sensible configuration for SX notebooks. But if you're serious about running *Windows*, you'll want 4MB to 5MB. Proprietary designs mean you'll probably be buying expansion memory from the company that sold you your notebook PC.

The modules' prices vary widely, with Toshiba and Compaq at the high end and Dell at the bottom.

You should reasonably expect to pay \$150 to \$175 for 1MB of RAM and about \$650 to \$800 for a 4MB SIMM. But at Toshiba's list prices, expanding the memory in your T2000SX costs from \$999 for 1MB to \$2,199 for a 4MB part. In contrast, Dell charges just \$149 for a 1MB upgrade, \$249 for 2MB.

And even identical memory for identi-

cal machines shows widely varying prices: Sanyo asks \$775 for 2MB of add-on RAM in its MBC-18NB; Zeos sells an identical part for the essentially identical Notebook 386 for \$349. (Of course, that's list against actual selling price; the direct marketing channel almost always has the lowest apparent prices because vendors' list prices include dealer margins and room for discounting.)

External display options If you plan to use an external monitor with your notebook—whether at your desk or for more impressive presentations when you're



PRICE/PERFORMANCE INDEX

Compaq, Toshiba, IBM, and Dell
Provide Performance at a Price

The Compaq, Dell, IBM, and Toshiba machines provide the best performance and features, but they are costly. Tangent, AST, and Tandon best balance affordability and moderate performance.

The original notebook 386SX, the Compaq LTE 386s/20, still has the best combination of performance and features; with its mid-April price cut, it gains a more competitive price.

This chart rates the 27 386SX 16- and 20-MHz notebook computers we reviewed on more than 20 features and performance items and plots these scores against the selling prices. The x-axis measures increasing performance; the y-axis, decreasing price.

The most well-rounded laptops are in the upper-right quadrant of the chart, characterized by high performance and high affordability. The bottom right quadrant is inhabited by good but somewhat less affordable performers—famous names like Compaq, Toshiba, and IBM.

WEIGHTINGS

Four of PC Magazine Labs' benchmark tests account for almost half a machine's value on the performance index: processor, memory, hard disk, and video tests. Three measures of portability account for another third: weight (including the transformer), size, and battery life. Another 15 percent reflects the amount of disk and system memory. The remainder of the score measures features that make a laptop more versatile and powerful: screen size, modem, dual-display capability, extra cursor keys, separate numeric keypad, I/O ports, power conservation, free carrying case, free software, mouse or other pointing

device, and extended warranty or free on-site service. More-sophisticated features also earned extra credit: For instance, a modem with error correction, V.42bis data compression, or fax capabilities was rated more valuable than a plain-vanilla 2,400-bps modem.

To arrive at the selling price charted on the y-axis, we took the system price and added the price of the most useful modem. Laptops available through dealers were discounted 25 percent (except for the Compaq, TI, and Toshiba, whose discounts are now closer to 15 percent). Mail-order systems such as the Dell and Zeos were not discounted.

WHY THE WINNERS WON

The Compaq scored among the highest largely on the basis of its superior performance. The Dell finished second and the Toshiba, third. The Toshiba's somewhat slower 16-MHz CPU performance was offset by its superb battery life and list of features. The IBM laptop also showed good all-around performance. Veridata's small size and battery efficiency offset its lack of a floppy disk drive.

Because the price/performance index is subjective, we've posted the worksheet used to create the chart on PC MagNet's editorial forum. Look for 14BANG.WK1 (the issue 14 bang-for-the-buck worksheet). You're welcome to rate other machines on this scale or tinker with the rating factors if you find one feature more important than the others.

These numbers are not directly comparable with the price/performance numbers in our reviews of 486/25 desktop PCs in the June 29, 1991, issue. Though the four performance numbers—as well as the disk drive and memory capacity numbers—have the same weighting, some features apply only to desktop machines (free slots), while others apply only to laptops (battery life, size, weight).

traveling—make sure you understand how the models you're considering handle external video. Only Samsung's NoteMaster, among the models we tested, allows simultaneous use of both the built-in display and an external monitor. Upcoming versions of the popular Cirrus Logic video chip set will offer this feature. For now, though, it can be a real pain to run a PC presentation from a notebook machine when you can't see on the its own screen what's coming up on the big color display. Check, too, to see if the internal display adapter can drive external monitors at

POWER RANKING JMSX NOTEBOOKS

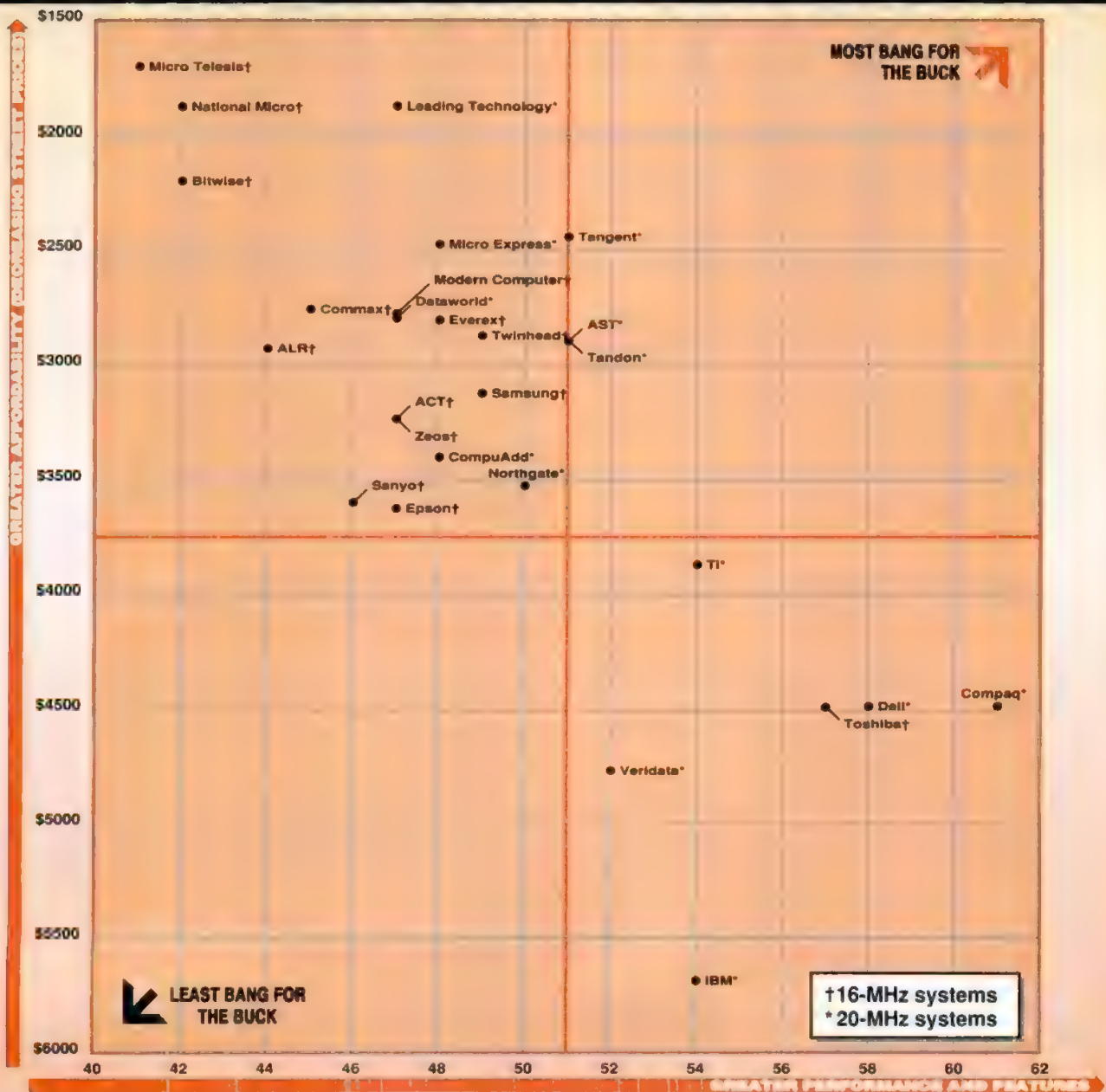
better-than-VGA resolution. The internal display adapter in TI's TravelMate 3000 and Dell's System 320N, for example, can support external monitors at resolutions up to 1,024 by 768 pixels. It even supplies the software drivers for *Windows* (and a few other programs) necessary to actually use those higher-resolution standards.

Battery life It's *never* long enough, no matter what the spec sheet says and no matter how certain you are that you don't

need more than, say, two and a half hours of computing between charges. So look for as much battery life as you can get when you go shopping.

The champs here are Toshiba's T2000SX, which didn't poop out on our Battery Rundown test till 3 hours 7 minutes, and the Dell 320N, which made it to 3:01. Though PC Magazine Labs tests the units at full power, sub-2-hour battery times place serious limitations on the usability of a notebook PC.

Interchangeable batteries can take some of the sting out of short battery life—but



at a cost. You not only have to buy the extra batteries; you have to keep them charged—and you have to haul them around with you.

For user-changeable batteries to be practical, they have to be easy to change. The ALR and Commax machines demonstrate how *not* to offer interchangeable batteries: You have to remove a panel above the keyboard, then unscrew two screws that hold down a metal retaining

plate. Juggling all those loose parts while changing batteries is as treacherous as it is unnecessary.

Dell has an especially good idea here: a tiny internal battery that gives you a couple of minutes of power while you swap the easily changed batteries. This way, you don't have to shut down the computer during battery swaps.

Power conservation tricks There are many ways to stretch battery life—and these machines use almost all of them. But there is power conservation, and then there's *power conservation*.

A well-designed notebook should offer several levels of power conservation, allowing users to choose among processor slowdown, hard disk spin-down, and screen blanking after a specified interval. These options should be built into CMOS



EDITORS' CHOICE

- Compaq LTE 386s/20
- Dell System 320N
- Toshiba T2000SX

Many of the 27 notebooks in this review offer unique features. The three that win Editors' Choice—the Compaq LTE 386s/20, Dell System 320N, and Toshiba T2000SX—offer more of them.

The 20-MHz Compaq LTE comes with a 4K processor RAM cache that gives it a noticeable performance edge over its competition: Its video and processor scores are unmatched. Our Price/Performance Index shows that Compaq provides, if not the best affordability, the best combination of features and performance. And this system has come more into line with its competition: You're likely to find an LTE with 3MB RAM and a 30MB hard disk, plus DOS 4.01, for about \$4,000 to \$4,200 on the street. (Add another \$369 for an error-correcting modem.)

Even at 16 MHz, Toshiba's T2000SX deserves Editors' Choice for its remarkable auto-resume feature and its 3-hour-plus battery life. Toshiba's notebook has a unique feature: You can put it to sleep and leave it for several days, then pick it up and return to your work right where you left off (a low-powered CMOS RAM helps the T2000SX perform this trick). The RAM and the nickel hydride battery boost the price of the T2000SX; street prices will likely be about \$4,000 to \$4,500.

Dell's System 320N, the third in this triumvirate, stands out for its 3-hour battery life, light yet solid construction, good performance scores, and, as always, proven service and support. At 6.4 pounds, it's the lightest of these three, and

Dell's power-management features are sure to extend your battery life even beyond the outstanding 3 hours we recorded in our tests.

Each of these systems has its Achilles heel. Compaq's is its L-shaped cursor key layout. Toshiba has an underpowered 16-MHz processor, and Dell skimps on its keyboard spacing. This just means there's room for improvement in the category. Nevertheless, all three will serve you well on the road and on your desk.

HONORABLE MENTION

Two other systems—the AST Premium Exec 386SX/20 and the Texas Instruments TravelMate 3000/CompuAdd CompanionSX duo—deserve honorable mention because they're well-rounded systems that balance good affordability with healthy performance and a respectable list of features.

The AST Premium Exec is easy to upgrade, and, of the 20-MHz notebooks, only Dell beats its 2-hour, 38-minute battery life. The system has solid power-management features (it powers down to 2.5 MHz whenever the processor is not in use), a bright screen, and a keyboard that's complete with an inverted-T cursor layout and dedicated PgUp, PgDn, Home, and End keys.

The CompuAdd/TI pair are a safe bet, and ever so lightweight. Unlike the TI TravelMate 3000, this TI-designed system includes an internal floppy disk drive, yet still weighs less than 6 pounds. TI bundles two software packages with its 20MB version and charges \$3,199 (though you can probably find some dealer discounts). CompuAdd's 20MB

version is slightly more bare-bones, but sells for \$2,999.

UNIQUE SOLUTIONS

A few systems come with one or two great features that may make them the best solution for a certain problem, even if they don't qualify for Editors' Choice or honorable mention.

The IBM PS/2 Model L40 is notable for its ability to hold 18MB of RAM, and especially for its remarkable keyboard. The full numerical keypad, the dedicated cursor keys (all in the most comfortable position), and the 5-degree angle make typing a pleasure. The system misses the mark, however, because its 2- by 13- by 11-inch dimensions are quite a bit larger than a notebook, and because its screen suffers from ghosting and streaking. IBM says it fixed the problem. Our advice: Try before you buy.

The Samsung NoteMaster (\$3,499 with a 20MB hard disk), for instance, is the only system with a dual display capability. Its cramped keyboard (with L-shaped cursor layout) and unremarkable performance, however, make it otherwise an average system.

Finally, Twinhead lets you carry 120MB of storage in its Supernote by designing the 3.5-inch drive bay to hold two 2.5-inch, 30MB hard disks. This feature puts the Supernote in a class by itself. Unfortunately, this system garnered some poor performance scores, has no space for an internal modem, and has the L-shaped cursor layout that we wish would disappear. Consider the Supernote if you value storage above all else.

"Since I began using a computer five years ago, my eyeglass prescription has increased three times."

Tom Judd, president and founder of Curtis Manufacturing, on why you should use a glare filter.

"Headaches, blurry vision, scratchy and burning eyes, overall visual fatigue ... These are the most common manifestations of monitor glare.

The solution? Get a glare filter.

The Curtis Anti Glare Glass Filter has been specifically designed to reduce monitor glare and improve on-screen contrast. Using one reduces headaches, visual fatigue, and even neck and back strain.

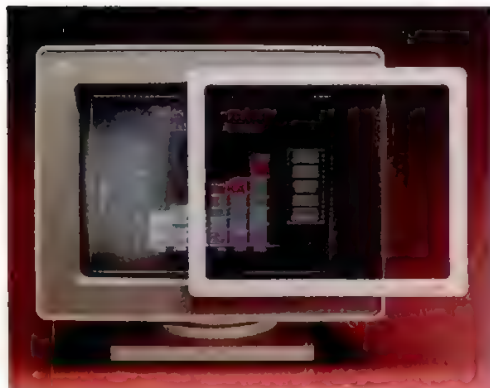
When I asked our design team to develop the highest quality, best value glare filter on the market, I learned that certain filter elements worked better than others."

Glass vs. plastic:

"When I tested the plastic models, they scratched so easily after one cleaning, I could see for myself that glass was significantly better."

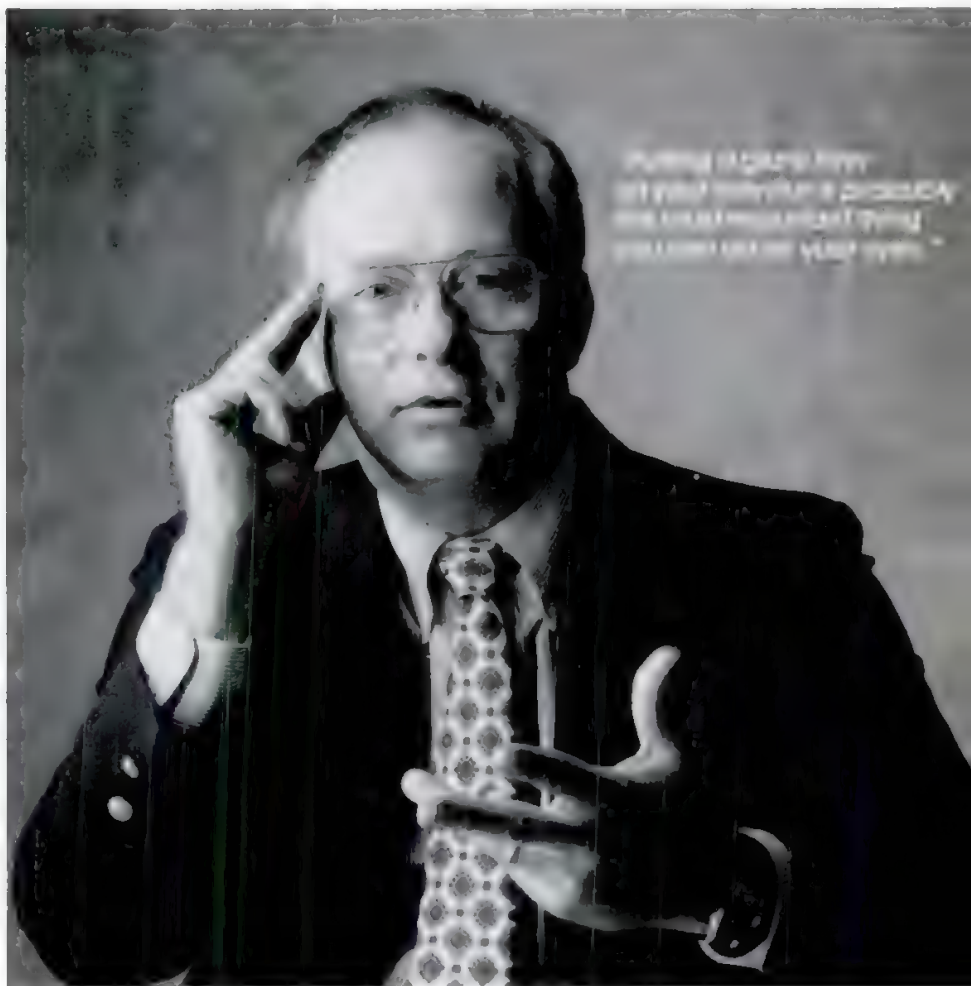
Glass vs. mesh:

"I have a high resolution color monitor. When I put a mesh filter on it, the monitor was harder to read, not easier. The mesh made the characters appear fuzzy."



Two-sided optical coating vs. one:

"I learned that monitor glare would hit both sides of the filter. A glass filter with optical coating on both sides visibly reduces glare better."



Cleaning the filter:

"All glare filters need to be cleaned occasionally. I asked, 'How?' Our design team answered by including a bottle of specially formulated, non-streaking cleaner and a lint-free cloth in every package.

Reversible frame:

"I asked for a durable, cosmetically attractive and ergonomically designed frame. Our designers delivered with a unique high-impact injection molded plastic frame which is black on one side—for those who want the utmost ergonomic design—and gray on the other side—for those who want to match the aesthetics of their monitor."

The results:

"The technical specifications of our filters are impressive: glare reduced by 95%, contrast improved 20 times. The design team told me how successful our product was, but I didn't realize it until I put one on my computer. What a

difference! In fact, the Curtis Anti-Glare Glass Filter worked so well, I had one added to every computer at our corporate headquarters."

If you'd like to know more about the Curtis Anti-Glare Glass Filter and other Curtis products that make life in front of a computer easier and less stressful, write or call for our free brochure: *Tips to Computing More Comfortably*, or for answers regarding the VDT radiation issue ask for *VDT's & Radiation Q&A for the Computer User*. Curtis Manufacturing Company, Inc., 30 Fitzgerald Drive, Jaffrey, NH 03452-1931. (603) 532-4123 Ext. 871

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RAM and be accessible at any time, not as external disk-based utilities that must be run before beginning work.

Look also for a *standby mode*, in which all power-saving features are initialized at once, either at your command or after a specified period of time, and a *suspend/resume mode*, accessible at a keystroke, or by simply closing the system's lid or turning the system off. Suspend/resume mode shuts down all of the notebook's peripherals and keeps only RAM active; this mode takes you a big power-saving step beyond standby.

Toshiba's well-known AutoResume feature, included in the T2000SX, is surely the most convenient and elegant of the suspend/resume options: hit one button, close the computer and walk away. Come back anytime within a week, pop open the PC, and in less than 5 seconds you're right back where you were, without rebooting, reloading programs, reopening files, and searching for your place in the file.

A final note on power-conservation tricks: If you're looking for a *Windows* machine, make sure the notebook you choose allows use of all of its battery-saving tricks under *Windows*. Many don't.

External expansion unit These notebook PCs come pretty fully equipped, so you may not worry much about their limited ability to add extra hard disks, 5.25-inch floppy disk drives, back-up systems,

and other devices. If you are concerned, ask about the availability of an expansion unit for the model you're considering.

Six of the machines we tested have companion desktop "docking units." Prices and capacities of these life-support systems vary greatly, though: Make sure that the expansion bay you buy really will accommodate that tape drive or other peripheral you want to attach, and that the connection is worth the often-substantial cost—sometimes as much as \$1,000.

GENERATIONAL CHANGE

One of the constant worries among computer buyers is that something better, faster, and cheaper is coming, just around the corner. The dirty little secret of the PC business: It is. But this group of 386SX notebooks has appeared at the right moment: This is the right time to buy a notebook PC, and these are the right machines.

Sure, faster machines are coming. Advanced Micro Devices has cloned Intel's 386SX chip, and in the process has jacked up its speed to 25 MHz while cutting its power requirements by about a fourth. We'll certainly see notebook PCs built around the AMD chip later this year.

Intel itself has introduced the 486SX chip, a junior partner to the company's top-of-the-line 486 microprocessor. The 486SX will also appear in notebooks before long—though its initial market will be powerful but moderately priced desktop machines.

And lower-power versions of both chips, such as Intel's 386SL, with its sophisticated on-board power-management tricks, will continue to push battery life up in the next generations of notebooks (see the sidebar "Beyond 386SX" for a look at these developments).

But there is "model-year" change, of the sort we see from Detroit every fall, and there is true generational change, which is much less common. While slightly faster 386SX and 486SX chips are alluring, the real decision isn't whether to wait for them but whether to choose between yesterday's 80286-based notebooks and today's SX machines.

There is true generational change between any 286 PC and a 386 PC. The latter, including all the SX notebooks in our tests, can run 386-specific software—and especially *Microsoft Windows*—efficiently. The 386 chip will remain the

computing platform of choice for business applications well into the 1990s—far beyond the probable useful life of any of these machines.

Sure the 486 is speedier, but it's basically just a souped-up 386 with external chip set functions brought on-board. That's model-year change.

With form factors of about 8.5 by 11 by 2 inches and the power of today's most popular desktop PCs, these SX notebooks have redefined our expectations for portable computing. As early buyers will testify: as we put them to work, they change how we work.

That's true generational change—and the right time to buy.

ADVANCED LOGIC RESEARCH

Venture/16

COMMAX TECHNOLOGIES

Notebook 386SX

by Bruce Brown

Here are two vendors' versions of the same basic machine—a machine that mixes good features with a few compromises. Advanced Logic Research and Commax Technologies each sell a 16-MHz, 386SX-based notebook computer manufactured by Nippon Board Computer Company. ALR calls its version the Venture/16, and Commax calls its the Notebook 386SX. The list prices (for the standard configuration, with a 20MB hard disk) are almost identical: \$2,795 for the ALR with DR DOS 5.0, and \$2,994 for the Commax with MS-DOS 4.01 and a nylon carrying case. Neither system is perfect—for example, changing the battery is a particularly cumbersome task—but terrific keyboards, fine screens, and easy memory expansion make either version a reasonable buy if you're willing to make some compromises.

CHUBBY

At 2.1 by 12.2 by 8.6 inches and 7.7 pounds with battery, the ALR/Commax machines are just barely acceptable for the notebook crowd. Since the 2- by 3- by 6.5-inch AC power adapter adds another 1.7 pounds and extra batteries are 1.2 pounds apiece, a complete traveling system including notebook with battery, AC adapter, one extra battery, and a cable or two would nudge the 11-pound level.

Battery life on this machine is lower

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outstanding value." — **PC Week**

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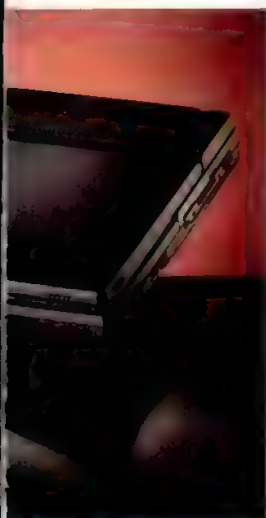
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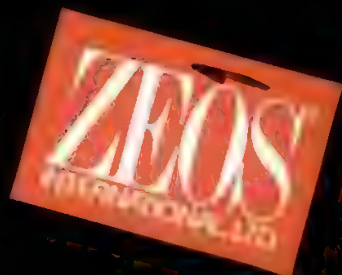
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 **PROCESSOR:** PC Magazine recommends a '286 or '386SX processor pointing out that "8086- and 8088-based portables have only half to a third of the computing power of a 286." That's why ZEOS offers you your choice, '286 or 386SX! More power for you. After all it's just like a 6.5 pound desktop!

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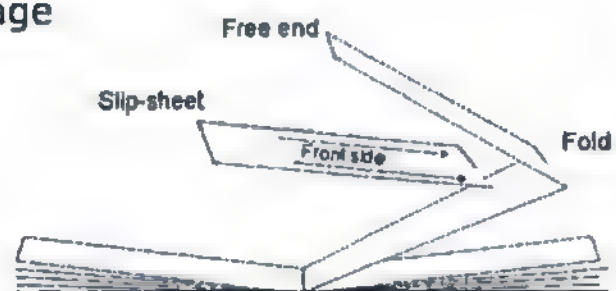
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GbsSlipSheet-001

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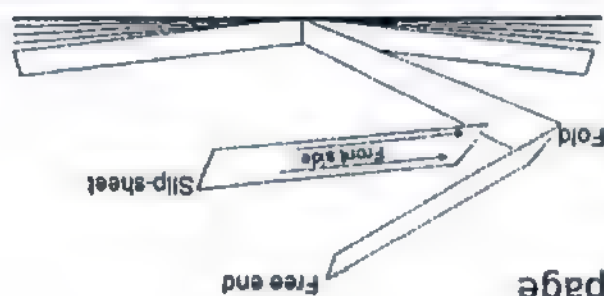
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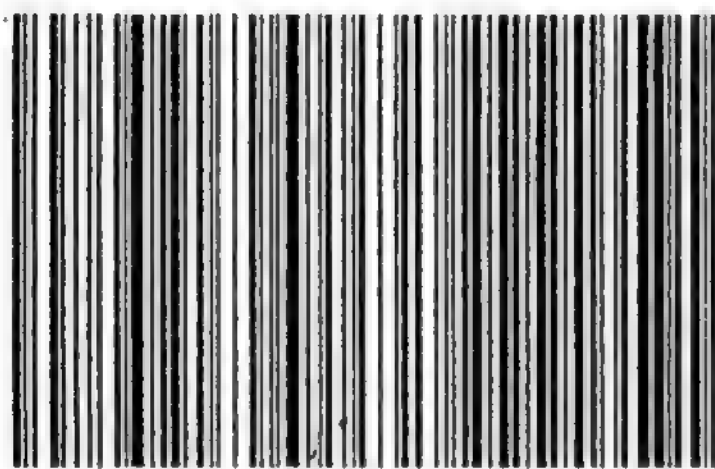
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GbsSlpBack-001B

Back

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For instance, the battery system of your new notebook is the most advanced on the market. You can quick charge, or trickle charge, any time your system is plugged in. You can also take the battery out and use the optional charging stand if you wish.

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Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but seven times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent.

Value: Excellent."

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."



Reason #5

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Reason #6

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Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

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ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

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Reason #10

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When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

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 Previous Address _____
 City _____ State _____ Zip _____
 Employer _____ Since? (Mo./Yr.) _____
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 Relationship _____

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 MasterCard _____ Other Major Charge Cards _____
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OH - THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

than average. On PC Magazine Labs' battery rundown tests the ALR lasted 1 hour 58 minutes and the Commax went slightly longer, at 2 hours 10 minutes. Both vendors claim 3-hour battery life with all power-saving features activated. You can adjust the display power-off and hard disk power-off intervals via the CMOS setup routine, the hard disk, or both to conserve the battery. But neither machine implements standby or sleep modes to shut down the CPU. Oddly, charging takes an inordinate 24 hours with the system on but only 2 hours with it off—clearly an argument for the latter charging strategy, especially if you carry extra batteries. There is no external charger currently available, nor does either vendor claim to have one planned.

The ALR/Commax's backlit, double-supertwist, 7- by 5-inch screen is made by Seiko-Epson. The display uses the whole screen and has sufficient brightness and contrast, both adjusted by tiny wheel controls on the screen's fold-up panel. The ALR/Commax uses the 32-gray-scale Cirrus Logic VGA chip set, with Cirrus's disk-based video utility set, *Switcher*, which is used for changing video modes and for switching between the internal

display and an external CRT. Running *Windows* 3.0 on the ALR/Commax reveals adequate shading to discriminate colors, although *Windows* in monochrome doesn't compare with *Windows* in color no matter how good the shading and resolution.

LOOSEN SCREWS

Port covers won't pop off this machine, but you may have to loosen some screws. The only two removable covers are a sturdy fold-down rear port cover and a full-width panel on the top of the open system just above the keyboard, which is the one you remove when you want to change the battery, upgrade memory, or add a math coprocessor. To change the battery, for example, you must lift off the panel, remove two small screws that hold down the wide metal battery retainer plate, lift out the battery, and disconnect a cable. On a crowded plane or train, it's easy to foresee dropping screws.

The keyboard has 82 keys, including an embedded numeric keypad activated by a special Fn key. There are 10 function keys; F1 and F2 do double duty as F11 and F12 when used in conjunction with the Fn key. The keyboard is very quiet and has a

superb layout with inverted-T cursor keys and four dedicated page-movement keys.

These machines come with 1MB RAM and accept upgrades to either 2MB or 5MB total using a single, easily accessible memory slot. ALR charges \$179 for the 1MB memory module and \$899 for the 4MB unit. Commax's retail prices for the same modules are \$199 for 1MB and \$650 for 4MB. These prices are quite reasonable when compared with those of manufacturers like Toshiba, which charges \$2,199 for 4MB.

Commax, while lesser known than ALR, has a wider range of disk drive upgrade options. Commax uses Conner Peripherals drives exclusively and will sell 40MB and 60MB hard disks for an extra \$385 and \$601, respectively. The Commax test unit came with a 60MB drive installed, which scored the fastest hard disk DOS File Access times among 16-MHz systems. Commax's greater variety of disk drive options at the time of testing makes it a more attractive choice for those needing the most space possible while on the road.

ALR sells a 40MB Toshiba hard disk upgrade for an extra \$500; an external 80MB drive is also available for \$995. ALR's DOS File Access time on the



FACT FILE

ALR Venture/16

Advanced Logic Research Inc., 9401 Jeronimo Irvine, CA 92718; 800-444-4257; fax: 714-581-9240.

List Price: \$2,974.

Tested Configuration: 2MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DR DOS 5.0.

Options: 1MB RAM upgrade, \$179; 4MB RAM upgrade, \$899; 80387SX/16 coprocessor, \$699. 80MB external hard disk, \$995; 2,400-bps modem with 9,600-bps send/receive fax, \$695; extra battery, \$129; AC power adapter, \$129; network adapter, \$495; carrying case, \$79.

CIRCLE 420 ON READER SERVICE CARD

Commax Notebook 386SX

Commax Technologies Inc., 2031 Concourse Dr., San Jose, CA 95131; 800-526-6629, 408-435-5005, 408-435-5000 (inside Calif.).

List Price: \$3,395.

Tested Configuration: 2MB RAM, 60MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.0.

Options: 1MB RAM upgrade, \$199; 4MB RAM upgrade, \$650; upgrade to 40MB hard disk, \$385; upgrade to 60MB hard disk, \$601; 80387SX/16 coprocessor, \$580. 2,400-bps modem with send-only fax, \$210; extra battery, \$99; AC power adapter, \$99; numeric keypad, \$69.

CIRCLE 424 ON READER SERVICE CARD



ALR Venture/16 (shown here) and the Commax Notebook 386SX have good features but lack an internal modem.

STATISTICS PROGRAMS

Statistical programs present a high degree of complexity that limits their use. Some of the test programs have been modified to minimize that complexity, but to a large extent they remain complicated. Programs originating in mainframe environments make few concessions to the PC environment and PC users.

- Syntex balances power and usability. SAS provides great power to users who master it, and Statgraphics is the easiest to learn and use. NISTL does not recommend the other programs for PC use except in businesses already running the mainframe version.
- Four of the statistics packages are sold as modules, and prices range from \$203 to over \$4,000 for a complete set. Refer to the Program Module Chart on page 19.
- Contrary to the common belief among statisticians, great differences in calculation speed separate the programs. Calculation speed can be very important to users who run frequent analysis of large data sets. (Performance Results, page 32).

Place this report in your binder behind the Miscellaneous Software tab divider.

Program	Version	Random Access	Quality	Usability	Performance	Price	Module	Check	Score
*** 775 Systat	5	600KB	\$3,270	✓	30				
*** 727.3 SAS Applications	5	640KB	\$4,870	✓	54				
*** 725.4 Statgraphics	pre 5	640KB	\$995	✓	26				
*** 6.0.4 SPSS/PC+	4.0	512KB	\$195- \$3,040	✓	26				
*** 1980 NISTL	1980	512KB	\$2,195	✓	22				
*** 1.5.1 Minitab	1.5	190KB	\$615	✓	26				

Rating Key
(On a scale of 0 to 10)
OVERALL EVALUATION
★★★★ 9.0 or higher

ALL OTHER RATINGS
★★ 6.0-6.9
★ 5.0-5.9
□ 7.0-7.9
□ 5.0-4.9
□ under 5.0

Contents

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✓ Recommendations	3
Power/Usability Chart	5
Rating Analysis	13-19
Program Reports	20-31
Value/Price Quality	32-40

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CIRCLE 297 ON READER SERVICE CARD



When you look at windows, it's not always clear what's behind them.

PC-mainframe software and a Windows interface is an ideal combination. After all, by making programs look similar, a graphical user interface makes them easier to learn and use.

But that can be a problem when you're evaluating software. After all, if programs look alike, how do you know which one is the standout?

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benchmark tests using a Conner 20MB hard disk drive was the slowest of the machines reviewed for this issue, a difference attributable to the system's use of DR DOS 5.0 instead of the standard Microsoft version. In many real-world applications, as well as on our tests, DR DOS often registers slower scores.

Each system has one ISA-compatible expansion port on the back of the machine that will work with an external expansion chassis currently under development, according to both companies. No specifications, ship date, or pricing are available for the expansion chassis.

NO INTERNAL MODEM

There is no provision for an internal modem—a disadvantage. The presence of two serial ports, however, makes it possible to attach an external modem and still leave the other port free for a mouse, file-transfer cable, or serial printer or plotter.

Both ALR and Commax sell through dealers—your first source of service dur-

COVER STORY 386SX NOTEBOOKS

ing the one-year parts-and-labor warranty. Both vendors have toll-free technical support lines, although Commax's 800 number doesn't work inside California. ALR dealers can sell optional service contracts using Intel's on-site service; and ALR has FAX and BBS numbers, neither of which is toll-free.

Commax, by comparison, offers a 30-day, money-back guarantee and promises to cross-ship a new system for a defective one if it can use your credit card number to guarantee payment in case the original unit is not returned.

In both these versions, this notebook computer only marginally fits the bill for its class. Its single outstanding feature is the keyboard, with its excellent design and feel. Inconvenient battery access is the biggest sore point, but this PC's 7.7-pound weight and lack of an internal modem slot are also disappointments, especially when compared with the lighter, more powerful notebooks available.

AST RESEARCH INC.

AST Premium Exec 386SX/20

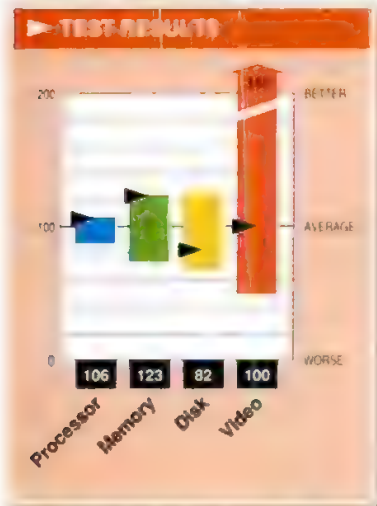
by Kellyn Betts

Here's a daring computer, for a change. Rather than hiding its virtue beneath a hermetically sealed exterior penetrable only by dealers, AST's portable makes its motherboard accessible to the user. This is only one of the midrange-priced Premium Exec 386SX/20's notable features.

The real benefit of this 20-MHz notebook is its user upgradability: to add more RAM—and this is one of the few machines to accept up to 8MB—or an internal modem, all you have to do is pull off the panel above the 7-pound machine's keyboard. AST even sells a hard-disk upgrade kit, though that option costs about \$350 more than if you bought a 40MB system, and in most cases AST requires an authorized dealer, reseller, or service facility to make the switch.

ALR Venture/16

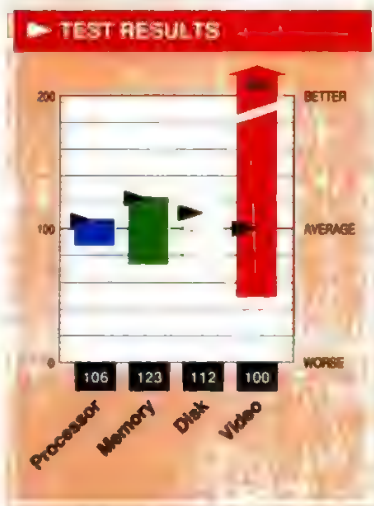
BATTERY RUNDOWN TEST SCORE:
1 HOUR 58 MINUTES



In Short: Like its Commax twin, the ALR 16-MHz Venture/16 notebook mixes good features—excellent keyboard, easy memory expansion, a plethora of ports, and a fine LCD—with some drawbacks: no provision for an internal modem, an awkward battery replacement scheme, and overall chubbiness. Unlike the Commax, the ALR Venture/16 was benchmark-tested with DR DOS and showed poor disk access times, landing at the bottom of our test group.

Commax Notebook 386SX

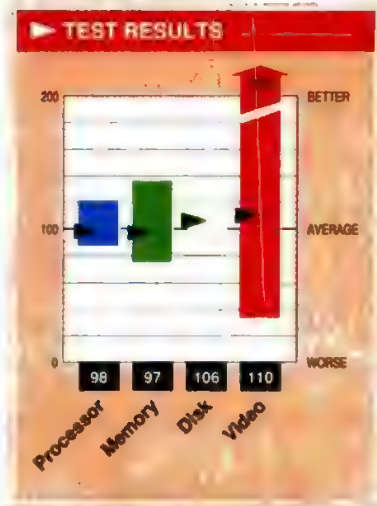
BATTERY RUNDOWN TEST SCORE:
2 HOURS 10 MINUTES



In Short: Good features can be found in this computer: fast access times on its 60MB hard disk (unlike its ALR twin, which was benchmark-tested with DR DOS), crisp screen, easy RAM upgrades, excellent keyboard, and solid performance numbers for its 16-MHz processor. But like the ALR, the Commax Notebook 386SX suffers from an awkward battery replacement scheme; even worse, it lacks provision for an internal modem—the kiss of death for any pretender to road worthiness.

AST Premium Exec

BATTERY RUNDOWN TEST SCORE:
2 HOURS 38 MINUTES



In Short: User upgradability is the hallmark of AST's 7-pound Premium Exec 386SX/20, along with better-than-average battery life and the second-fastest hard disk in our roundup. The Premium Exec accepts up to 8MB of user-installable RAM and a user-installable internal modem. Its external keyboard port doubles as a PS/2 mouse port, and its keyboard boasts eight dedicated cursor keys.

If this were a desktop, you'd be impressed by the NB-320SX's power and speed. By its versatility and stack of

anywhere. And if our incredible price isn't enough, read on.

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off most
note-
books
and

there
goes
your
screen.

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But to discover that we've fit all this into a 7 lb. box that fits sideways in the corner of your briefcase, now that's downright unheard-of.

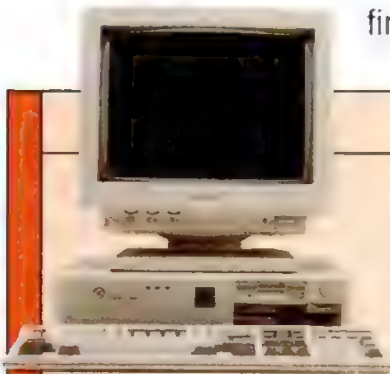
Packed With Value.

The NB-320SX is a 20MHz machine, giving you 25% more performance at about the same price as a 16 MHz. You won't find more for less,

But the NB-320SX is not your average notebook. It has a suspend mode that allows you to change batteries or turn off the system, then just hit a key and the screen reappears.

A unique, screen-by-screen tutorial is included. This way the notebook can teach you all about itself. Unlike other notebooks, we've also added a second serial port so you can add a mouse for Windows or other extras. An expansion chassis port gives you

even more possibilities. And, in case the clarity of our paper-white, backlit LCD screen isn't enough, there's a video port for



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Data 386/25



Data 386/20

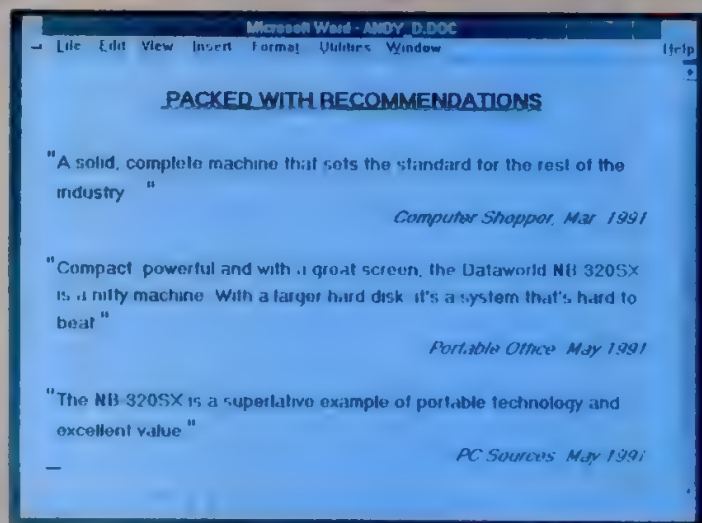


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FACT FILE

AST Premium Exec 386SX/20

AST Research Inc., 16215 Alton Pkwy., P.O. Box 19658, Irvine, CA 92713-9658; 714-727-4141; fax: 714-727-8858.

List Price: \$3,395.

Tested Configuration: 2MB RAM, 40MB Conner hard disk, 1.44MB floppy disk drive, external CRT adapter, VGA LCD, DOS 3.3.
Options: 4MB RAM upgrade, \$999. 2,400-bps modem, \$249; with send-only fax, \$349. Extra battery, \$99; AC power adapter, \$119; car battery adapter, \$129; numeric keypad, \$119; nylon carrying case, \$129; leather carrying case, \$299.

CIRCLE 421 ON READER SERVICE CARD

Compared with many of its peers, the Premium Exec's \$2,995 price—for our standard configuration with a 20MB Conner hard disk and 2MB of RAM—is reasonable to begin with. Our test machine had a 19-millisecond 40MB Conner hard disk, bringing the price to \$3,395—still quite competitive compared with others in its league. (The 40MB drive would be \$750 if you upgraded from the 20MB unit; a 60MB option is available for \$950.) With this drive, the AST is also quick: Of all the 20-MHz models, it posted the second-fastest time on our DOS File Access test.

COVER STORY 386SX NOTEBOOKS

The Premium Exec also did quite well on our Battery Rundown test: It kept going for 2 hours 38 minutes and was beaten only by the Dell machine. No doubt the AST's bag of battery-saving tricks will enhance its off-AC usability even further. The machine automatically steps down its processor speed from 20 MHz to 2.5 MHz after 5 seconds of idle time. CMOS setup options enable you to set the screen blanking and disk power-down times to intervals that range from less than a minute up to 19 minutes. Traveling Software's *Battery Watch* is bundled with the system to help you keep an eye on charge levels, as well.

In addition to a carrying case too small to hold both the 1.6-pound AC adapter and the computer, the Premium Exec bundles Traveling Software's *LapLink III*. While *LapLink* makes it easy to transfer large numbers of files to your desktop computer, the portable comes with enough connectors to allow it to function as a desktop PC in its own right. An external monitor, keyboard, and disk drive can all be plugged into the machine, though you lose your parallel port if you attach the disk drive. You must also choose between using the sole serial port for a printer or a

mouse. If you don't need the external keyboard, however, AST has cleverly added the circuitry required to make that port do dual duty as a PS/2 mouse port.

ON-SCREEN

The AST Premium Exec's triple-supertwist Epson screen is large and bright enough, but its necessarily long pixel persistence and tendency to echo images would make the addition of a CRT advisable if you tried to use the Premium Exec as a desktop, especially if you want to run *Windows*.

On the other hand, you might not feel the need for any other keyboard. The one on the Premium Exec has a good layout, with eight cursor control keys (the arrow keys are in the standard inverted-T layout) and the Insert and Delete keys in the lower-right-hand corner. The key travel is rather short, but the keys have a solid feel. AST promises it will soon be offering a stand that will allow the unit to be propped at an angle resembling that found on most standalone keyboards.

The AST Premium Exec 386SX/20's accessible motherboard, bright screen, excellent keyboard, and reasonable price make it quite appealing to any user willing to buy a notebook weighing over 7 pounds.

AUTOMATED COMPUTER TECHNOLOGY

Tempo 386SX

EVEREX

Tempo LX

SANYO

MBC-18NB

ZEOS

Notebook 386

by John R. Quain

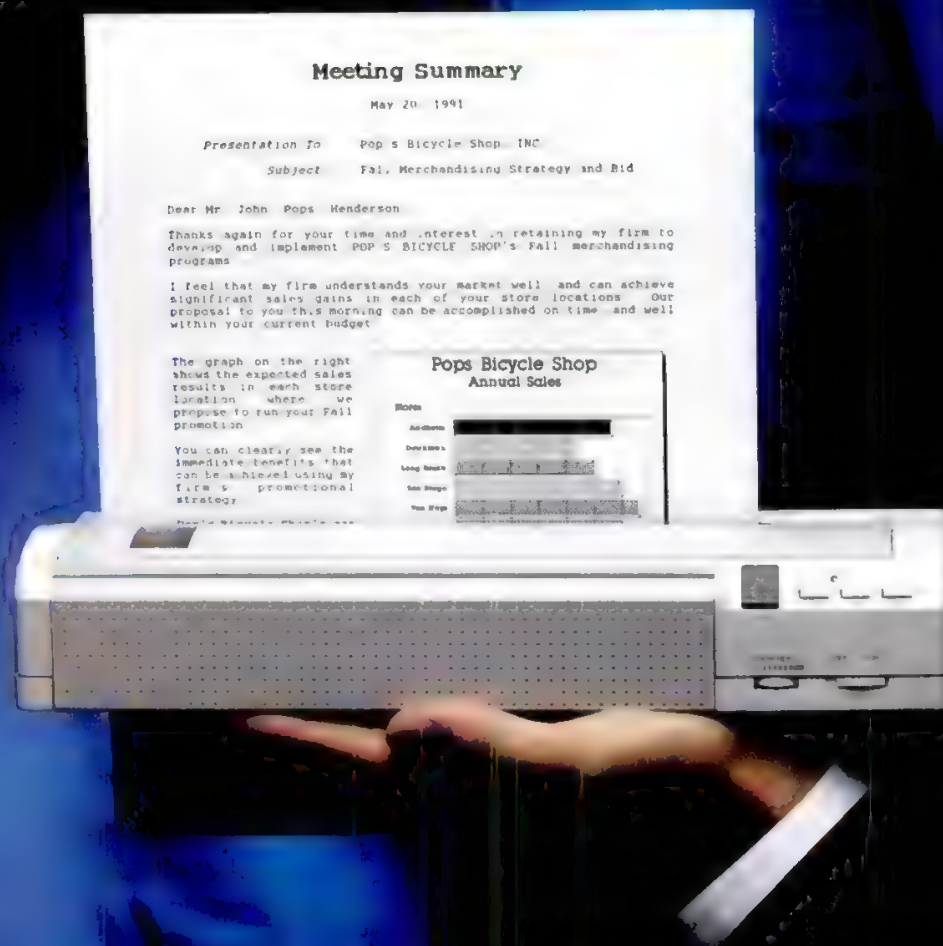
Think of the ACT, Everex, Sanyo, and Zeos 386SX notebooks as two sets of twins with slightly different approaches to life. All four are based on the same 16-MHz Sanyo motherboard, an Oak Technologies chip set, and Cirrus VGA video logic, but each one has subtle differences in temperament and appearance.

The Sanyo MBC-18NB and Zeos Notebook 386 are fraternal twins with distinct personalities. At \$4,274, the Sanyo is stingy, offering little above *PC Magazine*'s standard configuration (it has 3MB of RAM, a 20MB Conner hard disk, TEAC



Easy upgradability combined with a fast hard disk makes the AST Premium Exec 386SX/20 a machine to think about.

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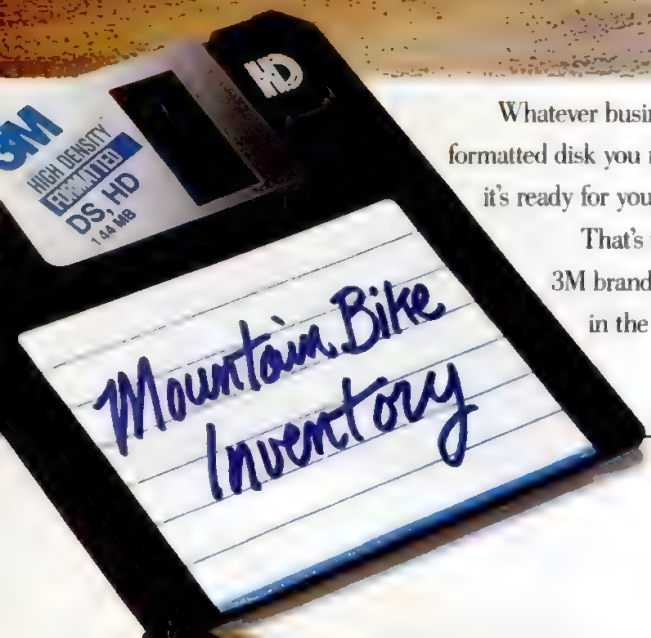
anything from letterhead to transparencies, the PN48 is an essential addition to any business. Its rechargeable NiCAD battery pack provides up to twenty-five laser-quality pages of portable printing power without recharging. With accessories that include an AC adapter/recharger, single and multi-strike cartridges and a soft carrying case, the PN48 Notebook Printer is a must have for anyone who's serious about portable computing. For further information call us at (800) 556-1234 ext. 34.



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386SX NOTEBOOKS

1.44MB floppy disk, and DOS 4.01). Even at about \$3,200 after a 25 percent discount, this system is the most expensive of the four, and only Sanyo doesn't include a soft carrying case in the price.

Zeos curries favor by bundling its \$3,014 Notebook 386 with a 2,400-bps MNP 5 internal modem, *ProComm Plus*, an extra battery, a battery charging stand, and a soft carrying case. It also sells extras at more competitive prices than Sanyo. For example, a 2MB RAM upgrade from Zeos lists for \$349, whereas Sanyo charges \$775 for the same upgrade.

If Sanyo and Zeos are fraternal twins, the Everex and ACT notebooks are identical twins. The two even arrive in identical packing boxes. Both come standard with *Windows 3.0* and a serial two-button Logitech mouse, though ACT goes to the trouble of installing *Windows* (or *Microsoft Works 2.0*, if you prefer) for you. Otherwise, the most apparent differences are in price and distribution channel. The retail Everex Tempo LX lists for \$3,299 in our standard configuration (about \$2,500 on the street), and ACT's mail-order version lists for \$2,845.

MORE SIMILAR THAN DIFFERENT

Although these systems have their differences, they're clearly all part of the same

family. Besides the motherboard and drives, each notebook has one serial and one parallel port, as well as one VGA monitor connection (but no simultaneous external display capability). All four PCs measure approximately 2 by 12 by 10 inches and add nearly 7 pounds to your briefcase before you toss in the supplied AC power adapter (1.8 pounds). DOS 4.01 and a single megabyte of RAM are standard, with 3MB and 5MB dealer-installable options available.

The foursome's power-drain reduction techniques include user-adjustable controls in CMOS setup and a disk of utilities. You can set the system to power down after intervals of 1 to 127 minutes, spin down the hard disk after intervals of 3 to 18 minutes, and turn off power to the optional modem. There is no separate screen-blanking feature per se, but you can cut the screen to half-brightness or shut it off with one of the utilities included. These notebooks go into sleep mode when you close the screen. There is not, however, a mode that stores the contents of RAM when the battery dies.

A warning LED and flashing screen alert you that the system only has 5 to 6 minutes of life left. More warning would

be better, but the removable battery can receive an 8-hour trickle charge while operating the notebook or a 1-hour quick charge with the system turned off. (Zeos throws in a separate battery charger stand free; Everex and ACT offer the same option for \$79 and \$90, respectively.)

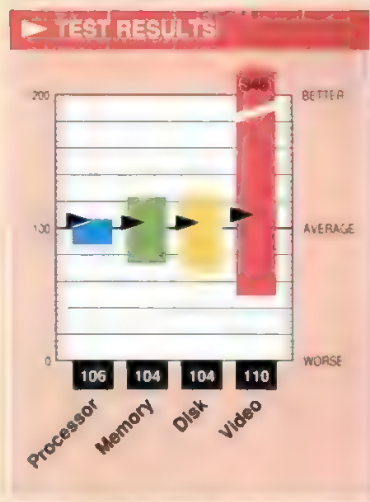
All four systems deliver better-than-average processor scores and moderately fast video times, compared with other 16-MHz systems. Their battery life is good, too: Three lasted for more than 2 and a half hours, though Sanyo's own model gave out after a still-acceptable 2 hours 22 minutes.

NOTABLE DIFFERENCES

Before you start phoning for the lowest price you can find, however, note a few more differences. For one thing, not all the screens are the same, though all have respectable performance and a crisp appearance. Sanyo and Zeos use Sanyo's own sidelit 5.8- by 7.5-inch supertwist nematic LCD technology to render 16 gray shades. (Zeos advertises 32, but not at maximum VGA resolution.) The screen

ACT Tempo 386SX

BATTERY RUNDOWN TEST SCORE:
2 HOURS 37 MINUTES



In Short: At \$2,845, the 16-MHz ACT Tempo 386SX is the least expensive of the four Sanyo-manufactured offerings in this roundup. It yielded a fine score on our Battery Rundown test—2 hours 37 minutes—and otherwise performed as well as any typical 16-MHz notebook. The ACT Tempo has eight dedicated cursor keys arranged in the standard inverted-T layout and comes with your choice of *Microsoft Works* or *Microsoft Windows* plus a serial mouse.



The ACT Tempo 386SX and Everex Tempo LX (shown here) are identical twins, distinguished only by differences in price and distribution methods.

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COVER STORY 386SX NOTEBOOKS

on the Everex and ACT twins is a hair smaller: each uses a sidelit 5.5- by 7.5-inch film-twisted nematic Seiko-Epson screen to achieve the same resolution and gray scale. All four displays use a diffuser to achieve consistent brightness across the screen. The result is comparable to backlit screens, yielding remarkably solid, readable text under any lighting conditions.

Of the four, the green-tinged Sanyo MBC-18NB's screen exhibited the least amount of streaking and appeared to be the brightest. LCD wavering, particularly prevalent on cross-hatched *Windows* graphics, was also less noticeable on the Sanyo notebook than on the other blue-tinged displays. But don't expect the clarity of a desktop monitor's CRT.

The key arrangements differ on each pair of twins as well—and neither is perfect. Everex and ACT use a Panasonic keyboard, which has dedicated Home, PgUp, PgDn, and End keys in addition to its four inverted-T arrow keys. Unfortunately, the Everex-ACT layout also juggles the CapsLock, Ctrl, and Alt keys—a bad

idea considering all the Alt-key combinations necessary when using a program like *Lotus 1-2-3*, where one wrong key-stroke can throw off your entire spreadsheet. By comparison, the Zeos-Sanyo design's cursor keys share the PgUp, PgDn, Home, and End duties, but the CapsLock, Ctrl, and Alt keys have more familiar positioning. All four keyboards are relatively noisy—enough to draw angry glares at a boardroom meeting. But the keys are full-sized and solid, with enough responsiveness to please touch typists.

The same basic case on all the notebooks extends sturdy protection to butterfingers owners, though the snap-on port cover has a tendency to fall off. The dual-hinged flip-up screen is set back far enough to give you ample latitude on fold-down airline tray tables. The main difference here: The Sanyo/Zeos case has a flexible pull-out handle; the Everex/ACT model doesn't. Otherwise, these cases are so similar that you can actually interchange

the nickel-cadmium batteries among all four. There's no expansion chassis for any of them yet, but an internal modem can be easily installed by the user.

ONE COMMON SNAG

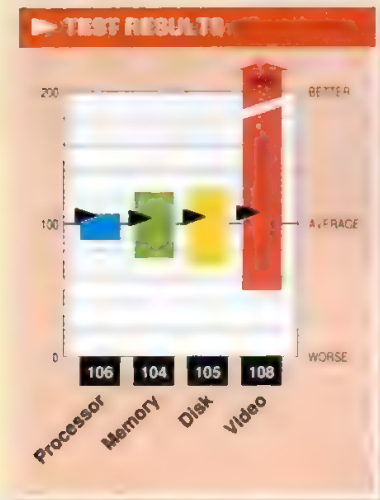
Any of these four 16-MHz 386SX notebooks would make a good computing companion. There's only one snag: not enough hard disk space. If you want *Windows 3.0* and more than one or two of today's disk-demanding applications, you'll need more than 20MB. Zeos offers both 40MB and 60MB hard disk options for an additional \$300 and \$600, respectively. The others have had a harder time obtaining the larger drives, but say that similar options will be available by publication date.

Everex also plans to market a 20-MHz version of the Tempo LX with 40MB (\$3,395) and 60MB hard disks (\$3,695, including a 32K cache). The increased processor speed is bound to give it an advantage over the other three.

All four companies offer one-year parts and labor coverage, though Everex makes

Everex Tempo LX

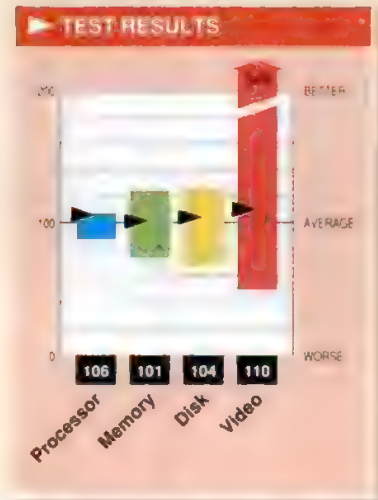
BATTERY RUNDOWN TEST SCORE:
2 HOURS 38 MINUTES



In Short: The Everex Tempo LX produced a slightly faster disk score than its three Sanyo-based 16-MHz brethren and lasted 2 hours 38 minutes on our Battery Rundown test. Its performance was otherwise unremarkable in our roundup. Its excellent keyboard includes eight dedicated cursor keys. Everex bundles *Windows 3.0* with this notebook and plans to release a 20-MHz version with a 60MB hard disk by the time this issue is published.

Sanyo MBC-18NB

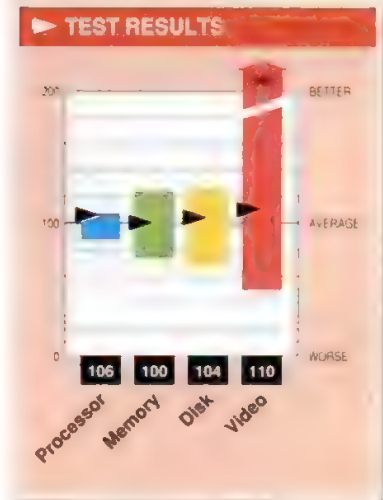
BATTERY RUNDOWN TEST SCORE:
2 HOURS 22 MINUTES



In Short: At \$4,274, the Sanyo MBC-18NB is the most expensive of the Sanyo-based models reviewed here and comes with the fewest bundled accessories. Its keyboard, however, sports four dedicated cursor keys in an inverted T, and its LCD screen showed the least streaking of the four. This notebook scored strong Battery Rundown performance at 2 hours 22 minutes. It has a pull-out handle; the carrying case is optional.

Zeos Notebook 386

BATTERY RUNDOWN TEST SCORE:
2 HOURS 36 MINUTES



In Short: The Zeos Notebook 386 is a 16-MHz portable with much to offer, including 2-hour-36-minute battery life and a host of included accessories. Although the Zeos Notebook 386 performance scores are unremarkable and its keyboard has only four dedicated cursor keys, Zeos offers reasonably priced 30MB or 60MB hard disk upgrades. Even better, you can call whenever you like for 24-hour, 365-day free technical support.

Quick, do you know
the first name
in microprocessors?

_____ 486™

_____ 386

_____ 386SX™



FACT FILE

ACT Tempo 386SX

Automated Computer Technology Corp., 10849 Kinghurst, Houston, TX 77099; 800-521-9237; fax: 713-568-1779.

List Price: \$2,845.

Tested Configuration: 3MB RAM, 21MB Conner hard disk, 1.44MB floppy disk drive, external CRT adapter, DOS 4.01, Windows 3.0, carrying case.

Options: 2MB RAM upgrade, \$350; 4MB RAM upgrade, \$700; upgrade to 40MB hard disk, \$400; upgrade to 60MB hard disk, \$700; upgrade to 80386SX/20 processor, \$200; 80387SX/16 coprocessor, \$295; 2,400-bps modem, \$305. External 2,400-bps modem, \$125; extra battery, \$125; Ethernet network adapter, \$450; ARCnet network adapter, \$350.

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Everex Tempo LX

Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 415-498-1111; fax: 415-657-0601.

List Price: \$3,299.

Tested Configuration: 3MB RAM, 21MB Conner hard disk, 1.44MB floppy disk drive, DOS 4.01, Windows 3.0.

Options: 2MB RAM upgrade, \$400; 4MB RAM upgrade, \$800; upgrade to 40MB hard disk, \$525; 80387SX/16 coprocessor, \$399. 2,400-bps modem with MNP 5 data compression, \$329; extra battery, \$125; AC power adapter, \$145.

CIRCLE 542 ON READER SERVICE CARD

the user pay for tech support phone calls. Zeos beefs up its arrangement with a "round the clock and 'round the calendar" free tech help line.

Choosing between these four machines actually comes down to choosing between the accessory-laden Zeos Notebook 386 and the possible advantages offered by the Everex Tempo's and the ACT Tempo's keyboard design. If you prefer to choose a 16-MHz model over a faster 20-MHz notebook, any one of these four is a wise investment.

BITWISE

386SX/16 Notebook

MICRO TELESIS

NBA386SX

NATIONAL MICRO SYSTEMS

386SX/16 Notebook

by Bill O'Brien

Three of Nan Tan Computer's 2200 notebook portables, sent by Bitwise, Micro Telesis, and National Micro Systems,

Sanyo MBC-18NB

Sanyo Business Systems Corp., 51 Joseph St., Moonachie, NJ 07074; 800-524-0047; fax: 201-440-1755.

List Price: \$4,274.

Tested Configuration: 3MB RAM, 21MB Conner hard disk, 1.44MB floppy disk drive, DOS 4.01.

Options: 2MB RAM upgrade, \$775; 4MB RAM upgrade, \$1,550. 2,400-bps modem with MNP 5 data compression, \$390; extra battery, \$155; AC power adapter, \$199; numeric keypad, \$155; carrying case, \$70; leather carrying case, \$125.

CIRCLE 801 ON READER SERVICE CARD

Zeos Notebook 386

Zeos International Ltd., 530 5th Ave. NW, St. Paul, MN 55112; 800-423-5891; fax: 612-633-8296.

List Price: \$3,014.

Tested Configuration: 3MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, DOS 4.01, Oak EMM, 2,400-bps modem with MNP 5 data compression, extra battery, AC power adapter, charging stand.

Options: 2MB RAM upgrade, \$349; 4MB RAM upgrade, \$649; upgrade to 40MB hard disk, \$300; upgrade to 60MB hard disk, \$600; 80387SX/16 coprocessor, \$319.

CIRCLE 808 ON READER SERVICE CARD

arrived for review. The 16-MHz 80386SX machines are midrange performers priced at \$1,995, \$1,699, and \$1,874 respectively by their vendors. Each machine is available only by mail order.

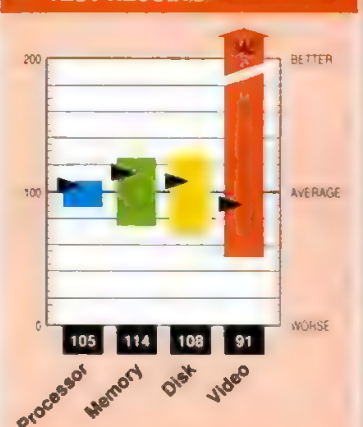
At 2 by 12 by 10.5 inches, this computer is slightly larger than most notebooks, but at 6.9 pounds, it's no shoulder buster. If you add 2 pounds for the weight of the charger, cables, and the case itself, you still end up with a package well under 10 pounds. The machine's standard features include 2MB of memory (expandable to 5MB), a side-mounted 1.44MB floppy disk, a 20MB hard disk, a 5.3- by 6.8-inch triple-supertwist VGA LCD screen with 16 shades of gray in either normal or inverse screen mode, one parallel and two serial ports, connectors for an external monitor and a floppy disk drive, and DOS 3.3. There is no internal modem option, but with two serial ports, it's possible to run a pocket-type modem and still have a port to spare.

The system's pair of battery packs is rated for 2 to 3 hours of operation; indeed, PC Magazine Labs' Battery Rundown test pegged all three of these notebooks at

Bitwise 386SX/16 Notebook

BATTERY RUNDOWN TEST SCORE:
1 HOUR 58 MINUTES

▶ TEST RESULTS



In Short: This 6.9-pound 16-MHz notebook from Nan Tan performed acceptably on our benchmark tests, as did its National Micro Systems sibling. Its 8-bit video garnered a low score, but otherwise the Bitwise 386SX/16 Notebook proved adequate, with 2-hour battery operation, separate page-movement keys, and an inverted-T cursor-key layout. Lack of space for an internal modem limits this unit's use for on-the-road connectivity.

a credible 2-hour duration.

Both the screen and keyboard are highlights for the notebook. All cursor-control and editing keys are implemented on the 82-key keyboard. Rather than adding a plethora of secondary key functions, the solitary Fn augment key activates F11 and F12 function keys and adjusts system features. An exception is the Fn-F10 combination, which changes the embedded numeric keypad into embedded cursor controls. Because this change is redundant with the eight existing cursor-control keys, you'll probably never need to use it.

Thanks to the Cirrus Logic video chip set, the video display did a flawless job with Windows under gray-scale interpretation. No visible differences were detected, even though both the Bitwise and the Micro Telesis had Epson displays while the National Micro Systems unit had a Sharp. The only hitch we encountered was that the system failed to recover correctly from sleep mode while Windows was running—a problem not uncommon

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in this laptop group. And although side-mounting the screen controls is not always the best idea, Nan Tan has positioned them far enough toward the rear of the notebook to make accidental screen readjustment difficult.

Standard DIPs with standard RAM prices make up the existing 2MB of RAM, expandable to 5MB. Bitwise advertised only slightly higher expansion RAM costs than either Micro Telesis or National Micro Systems. But when it came to storage, Bitwise quoted \$200 and \$400 upgrade prices for the notebook with 40MB or 60MB hard disks, right in line with its two competitors.

COVER STORY

386SX NOTEBOOKS

As with most of the notebooks reviewed in this issue, each of these is user upgradable, by removing two screws and lifting the keyboard to expose the motherboard. But one caveat applies: If you're one of those people who can never get a box repacked just the way it came, don't open up this notebook computer.

All three notebooks came with an Award BIOS and a Headland chip set. The Micro Telesis notebook had a later version of the Headland chip set, which is what probably gave it a slight advantage on the PC Labs Instruction Mix test. PC Labs hard disk tests showed no appreciable difference in performance among the three units, even though Bitwise and National Micro Systems had a Conner hard disk and Micro Telesis, a JVC.

Nan Tan has implemented the standard Award BIOS Ctrl-Alt-Esc key sequence to enter CMOS while booting the computer, but there is no way to access the power-saving techniques from there. Rather, at the DOS level, an Fn-Esc key

combination brings up a pop-up menu that regulates normal or inverse video, screen centering, bold versus normal character display, internal or external video, and other features such as screen and disk power-down.

Unfortunately, this menu is not a BIOS function. It's accessed only after invoking a driver file in CONFIG.SYS. A second driver contains the code page information needed by the Cirrus Logic video chip set, and a third driver enables video BIOS shadowing.

All three drivers together take up 23K of system RAM. More important, however, an operating environment like Windows can block the key combinations these TSRs use. There are better ways to avoid TSR trouble while implementing pop-ups, and Nan Tan says it is currently working on them.

DOCUMENTATION

Nan Tan's user manual has all the information you need to set up and operate this notebook, but it occurs in an eccentric order. Turning the machine on isn't de-



FACT FILE

Bitwise 386SX/16 Notebook

Bitwise Designs Inc., 701 River St., Troy, NY 12180; 800-367-5906; fax: 518-274-0755.

List Price: \$1,995.

Tested Configuration: 2MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, AC power adapter, DOS 3.3, vinyl carrying case.

Options: 3MB RAM upgrade, \$120; 5MB RAM upgrade, \$380; upgrade to 40MB hard disk, \$200; upgrade to 60MB hard disk, \$400; 80387SX/16 coprocessor, \$345. External floppy disk drive, \$250; 2,400-bps modem, \$200; extra battery, \$100; car battery adapter, \$200; numeric keypad, \$50.

CIRCLE 423 ON READER SERVICE CARD

Micro Telesis NBA386SX

Micro Telesis Inc., 1250 Logan A2, Costa Mesa, CA 92626; 714-557-2003; fax: 714-557-9729.

List Price: \$1,699.

Tested Configuration: 2MB RAM, 20MB JVC hard disk, 1.44MB floppy disk drive, VGA LCD, AC power adapter, external CRT adapter, DOS 3.3, vinyl carrying case.

Options: 1MB RAM upgrade, \$69; upgrade to 40MB hard disk, \$200; upgrade to 60MB hard disk, \$400; 80387SX/16 coprocessor, \$290. External floppy disk drive, \$125. 2,400-bps modem, \$145; with MNP 5 data compression, \$179; with send/receive fax, \$99. Extra battery, \$45; car battery adapter, \$79; network adapter, \$140; expansion chassis, \$249; numeric keypad, \$49.

CIRCLE 546 ON READER SERVICE CARD

NMS 80386SX/16 Notebook

National Micro Systems Inc., 2833 Peterson Pl., Norcross, GA 30071; 404-446-0520; fax: 404-449-5297.

List Price: \$1,874.

Tested Configuration: 2MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 3.3, vinyl carrying case.

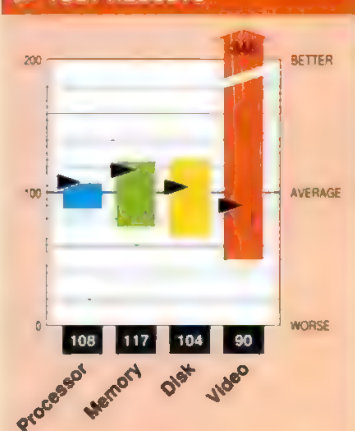
Options: 1MB RAM upgrade, \$75; 4MB RAM upgrade, \$95; upgrade to 40MB hard disk, \$200; upgrade to 60MB hard disk, \$350; 80387SX/16 coprocessor, \$349. External floppy disk drive, \$149; extra battery, \$99; numeric keypad, \$79.

CIRCLE 546 ON READER SERVICE CARD

Micro Telesis NBA386SX

BATTERY RUNDOWN TEST SCORE:
2 HOURS 0 MINUTES

TEST RESULTS

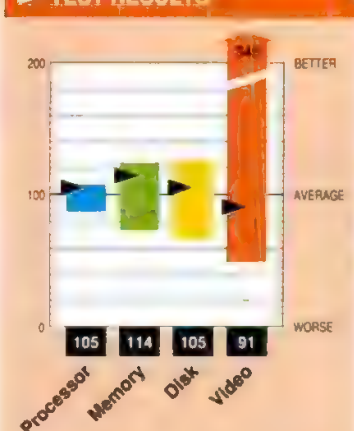


In Short: Of the three Nan Tan-manufactured 16-MHz notebooks in this roundup, the Micro Telesis NBA386SX scores best on the processor test. This 6.9-pound sibling to the machines from Bitwise and National Micro Systems proved a disappointment on our video test because of its 8-bit video. On the plus side, it has 2-hour battery operation, separate page-movement keys, and an inverted-T cursor-key layout. Buy elsewhere if you need an internal modem.

NMS 80386SX/16 Notebook

BATTERY RUNDOWN TEST SCORE:
2 HOURS 15 MINUTES

TEST RESULTS



In Short: This 6.9-pound 16-MHz Nan Tan-manufactured notebook was a disappointment on our video test. Two-hour-15-minute battery operation, separate page-movement keys, and an inverted-T cursor layout testify to the NMS 80386SX/16 Notebook's thoughtful design, but the lack of space for an internal modem should cause concern for those on the go.

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Like the T2000SX, the T2000SXe weighs a minuscule 6.9 pounds, it boasts a 386SX processor, and it supplies up to 60 MB of hard disk storage space. But, and here's the news, the T2000SXe gives you a bigger dose of speed (20MHz) and more memory (2-10 MB RAM).

Of course, the T2000SXe also offers Hypertext, a VGA screen, full modem capabilities (including available cellular and fax accessories), full-size sculpted keys on its keyboard and a host of additional benefits that make other notebooks look more like memo pads.

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There is no clear standout among the Bitwise 386SX/16 Notebook (shown here), the Micro Telesis NBA386SX, and the NMS 80386SX/16 Notebook.

scribed until Chapter 4, although procedures for setting up the CMOS parameters and adding RAM chips are given in the first 60 pages.

All three vendors cover their respective notebooks with the same one-year parts and labor warranty under a return-to-vendor plan.

Although this Nan Tan 2200 notebook is rough in a few areas, there really isn't anything seriously enough wrong with it to preclude a purchase. On the other hand, if it does become your notebook of choice (which it might if low price is your top priority), no single vendor stands out enough among these three to gain a clear-cut edge. It's a coin toss on all accounts.

COMPAQ LTE 386s/20

by Joseph Desposito

Compaq's recent \$2,100 price drop from \$6,499 to \$4,399 on its LTE 386s/20 model undercuts notebooks like the IBM L40 SX by more than \$1,000. But at a shade under 8 pounds, the LTE 386s/20 is hardly

a lightweight: Add to this an extra battery (1.8 pounds), A/C adapter, a couple of cables, and a carrying case, and the total weight can easily exceed 13 pounds—more than most travelers would like to carry. But this unit is indeed a top performer.

The unit's list price includes a 30MB hard disk and 1.44MB floppy; \$400 more gets you a 60MB hard disk. Some users, however, may find it inconvenient to insert floppy disks into the front.

The edgelit, VGA-compatible, super-twist LCD screen measures 5 by 7 inches and is easily legible.

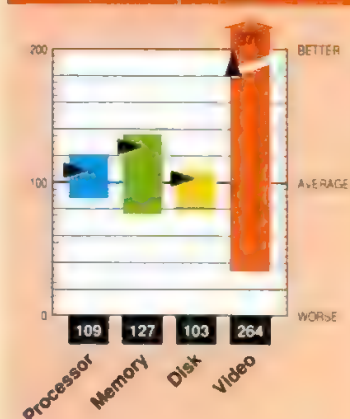
Most of the keys on the LTE 386s/20 keyboard are standard size, though its cursor and function keys are only three-quarter size. The four cursor keys are laid out in an L-shape that is swiftly becoming nonstandard. You can add a \$119 external keypad, but you'll need an \$89 adapter to connect a standard keyboard.

Compaq rates this battery for 3 hours; with all the power-saving features disabled, the LTE 386s/20 lasted 2 hours 34 minutes on the PC Magazine Labs Battery Rundown test. Although that might at first seem strong, it's not particularly efficient: It achieves only about 90 minutes per

Compaq LTE 386s/20 Model 30

BATTERY RUNDOWN TEST SCORE:
2 HOURS 34 MINUTES

▶ TEST RESULTS



In Short: A small footprint, fast RAM cache, superior performance, and an excellent screen remind us why Compaq's 20-MHz notebook remains a market leader, despite its awkward keyboard layout. At nearly 13 pounds after you add the case, extra battery, and cables, the LTE 386s/20 pins the needle on the burrito scale. Nonetheless this notebook—one of the most feature-rich you can buy—is even more attractive since its mid-April price cut.

pound of battery weight, compared with a class average of 106 minutes.

Standby mode can be invoked by pressing a standby button to shut down all subsystems, or automatically at regular intervals. A software utility gives you complete control over the interval timing for each subsystem. When you return to normal operating mode, everything is just as you left it—including *Windows*—provided that the battery has not run down completely.

A 2- by 3- by 5-inch, 1.5-pound AC adapter offers an alternative to battery power. Extra batteries cost \$169.

Adding memory beyond 2MB (the LTEs/20 accepts up to 10MB) is a cinch. You pop off a plastic cover at the left side of the unit and slide in a credit-card-sized memory module. Compaq sells 1MB modules for \$349 and 4MB for \$1,499.

Compaq's 2,400-bps internal modem, with V.42bis and MNP 5 data compression and error correction, costs \$369. Installation is best done by a Compaq dealer.



FACT FILE

EDITORS' CHOICE

Compaq LTE 386s/20 Model 30

Compaq Computer Corp., 20555 State Hwy. 249, Houston, TX, 77070; 800-231-0900, 713-370-0670.

List Price: \$4,987.

Tested Configuration: 3MB RAM, 4K processor RAM cache, 30MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01, battery, AC power adapter, carrying case.

Options: 1MB RAM upgrade, \$349; 4MB RAM upgrade, \$1,499; upgrade to 60MB hard disk (Model 60), \$400; 80387SX/20 coprocessor, \$999. External floppy disk drive, \$275; tape drive module, \$399; 2,400-bps modem with MNP 5 data compression, \$369; expansion chassis, \$999; extra battery, \$169; car battery adapter, \$129; numeric keypad, \$119; carrying case, \$89.

CIRCLE 425 ON READER SERVICE CARD

At the rear of the LTE 386s/20 are five ports and an expansion connector. A sliding plastic cover protects them. The major expansion option is the \$999 Desktop Expansion Base: It has space for two storage devices and two ISA boards.

The LTE 386s/20 had the quickest times in the processor, memory, and video categories. This is partly due to its 4K RAM cache, a unique enhancement for this machine's class. A one-year warranty

is serviced through authorized Compaq Computer dealers. Compaq also has a technical assistance phone line that operates from 7 A.M. to 7 P.M. C.S.T., Monday through Friday.

Although there is no question about the sturdiness of the Compaq design, and although the \$2,100 price cut is notable, this 20-MHz notebook remains one of the heaviest and most expensive in its class. Its high performance on our tests is laudable, but you may find it hampers your own performance by its nonstandard L-shaped cursor-key layout. Unless you need the Compaq name on your notebook, you'll find more elsewhere, and for less.

COMPUADD

CompanionSX

TEXAS INSTRUMENTS

TravelMate 3000

by Patrick Honan

The TravelMate 3000 and the CompuAdd CompanionSX (manufactured by Texas Instruments) are upgraded versions of the popular 286-based TravelMate 2000 and

the CompuAdd Companion, which were named Editor's Choice selections in the March 12, 1991 issue of *PC Magazine*. They weigh 5.9 pounds—1.6 more than the 286 units—but have a 20-MHz 386SX processor and a built-in 3.5-inch floppy disk drive that eliminates the need for file-transfer utilities. Like their 286-based counterparts, they live up to their names. These identical units are easy on your wallet, your shoulder, and your patience.

Standard configuration prices with a 20MB hard disk are \$3,199 for the TravelMate 3000 and \$2,999 for the CompanionSX. The TravelMate 3000 we tested, which came with a 60MB hard disk, carries a price of \$4,199. Like Compaq, TI recently shaved about 35 percent off its list prices. But dealer margins will be slimmer, according to a TI representative; gone are the days of 30 percent discounts. But Texas Instruments sweetens the deal by bundling *Battery Watch* and *LapLink*, two useful utilities not included with the CompuAdd CompanionSX.

Both units measure 1.8 by 11 by 8.5 inches. The AC power adapter measures 2 by 5.75 by 3.25 inches and weighs 1.4 pounds, bringing the total weight for a completely functioning computer to 7.3 pounds. CompuAdd includes a nylon carrying case at no extra charge, and Texas



Excellent performance compensates for the relative heft and the L-shaped cursor layout of Compaq's LTE 386s/20 Model 30.



FACT FILE

CompuAdd CompanionSX

CompuAdd Corp., 12303 Technology Blvd., Austin, TX 78727; 800-627-1967.

List Price: \$2,999.

Tested Configuration: 2MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, AC power adapter, DOS 4.01.

Options: 2MB RAM upgrade, \$398; upgrade to 40MB hard disk, \$300; 80387SX/20 coprocessor, \$289. 2,400-bps modem with send-only fax, \$399; extra battery, \$109; car battery adapter, \$89; numeric keypad, \$75; leather carrying case, \$169.

CIRCLE 426 ON READER SERVICE CARD

TravelMate 3000

Texas Instruments, P.O. Box 202230, Austin, TX 78720; 800-527-3500.

List Price: \$4,199.

Tested Configuration: 2MB RAM, 60MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01.

Options: 2MB RAM upgrade, \$299; upgrade to 40MB hard disk, \$500; 80387SX/20 coprocessor, \$739. 2,400-bps modem with MNP 5 data compression and send-only fax, \$499; extra battery, \$99; numeric keypad, \$69; carrying case, \$49; deluxe carrying case, \$69.

CIRCLE 404 ON READER SERVICE CARD

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Banyan Vines	▲	▲	●
FTP Software PC/TCP	▲	▲	
Wollongong WIN/TCP	●	▲	
10SET TCP/IP		▲	
MCSA TCP/IP		▲	
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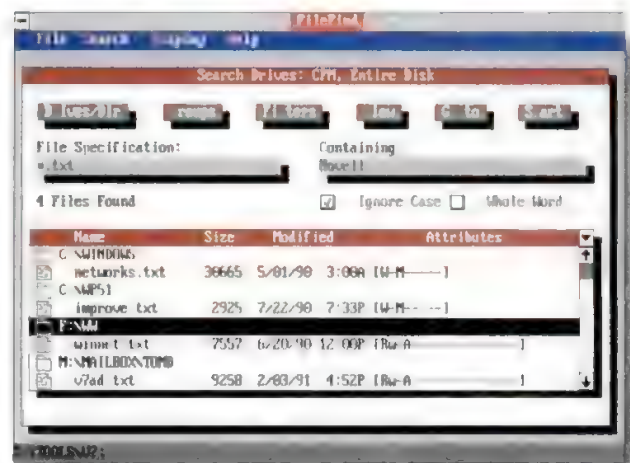
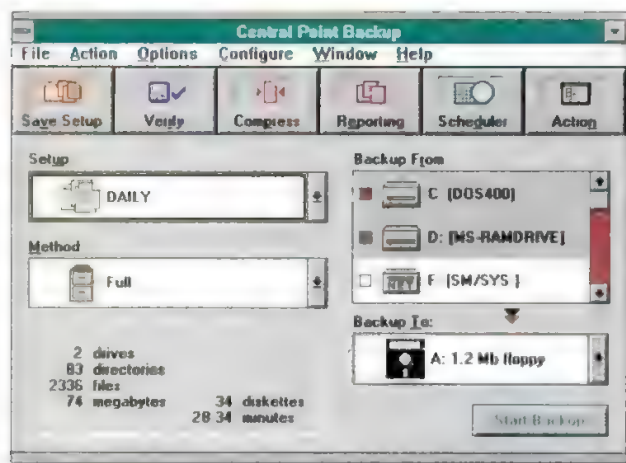


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CIRCLE 211 ON READER SERVICE CARD

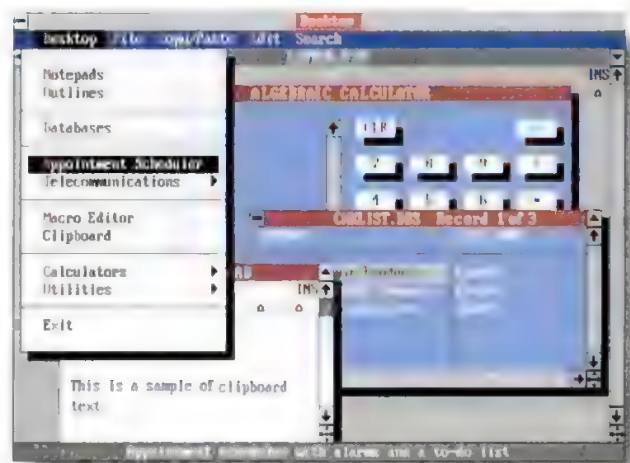
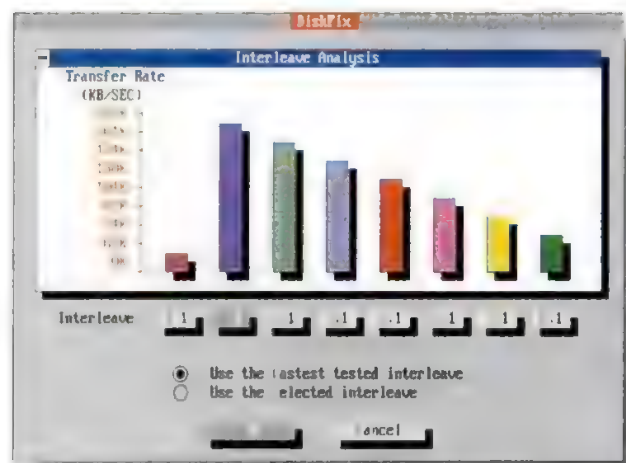
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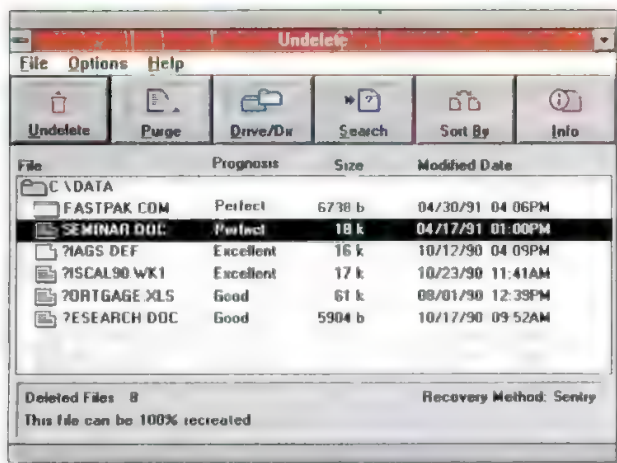
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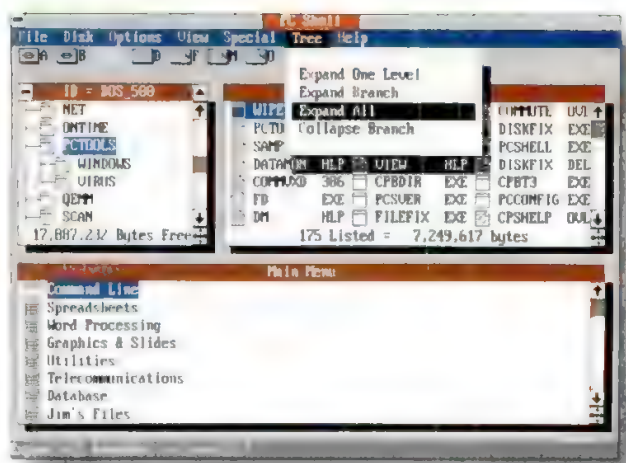


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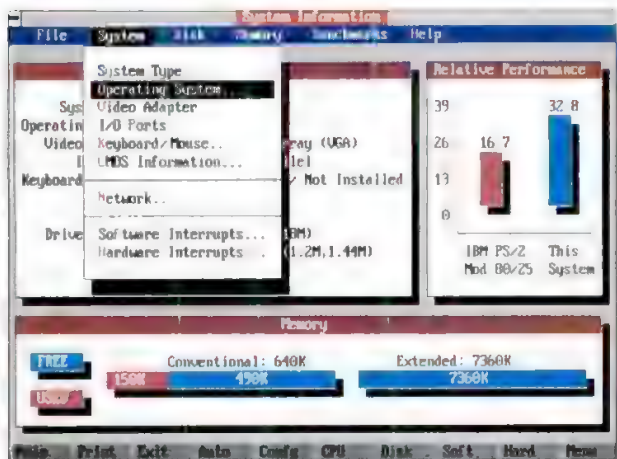
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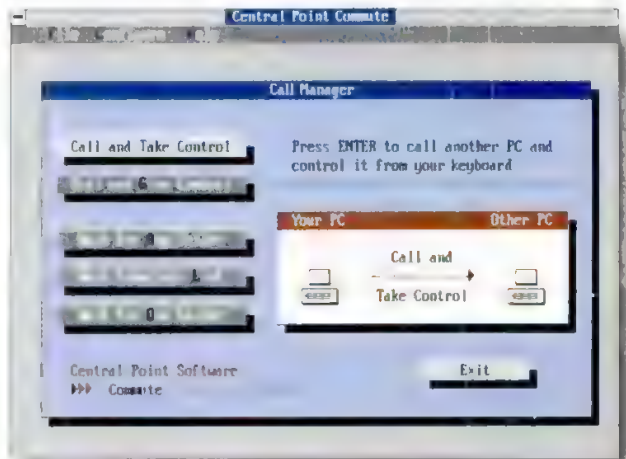
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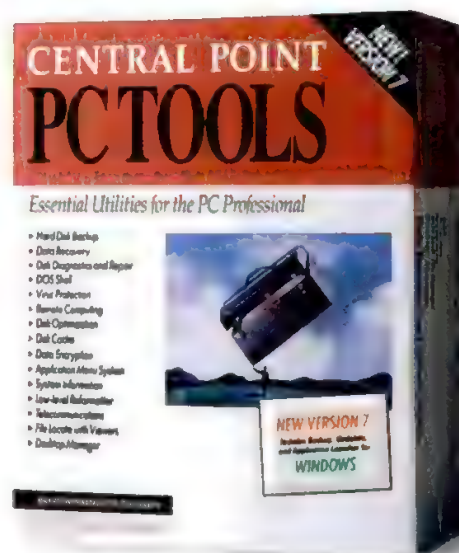
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Instruments offers a leather case for \$49. Both cases have no padding or room for the AC power adapter but are adequate for carrying the computer between home and office or on a short trip. A larger, padded-leather carrying case with room for the power adapter, disks, and paperwork is available from both vendors.

BATTERY BLUES

On PC Magazine Labs' battery rundown test, the TravelMate 3000 lasted for 1 hour 46 minutes; the CompanionSX, 2 hours and 5 minutes. We then switched batteries and ran the test again. This time, the TravelMate 3000 lasted 1 hour 53 minutes; the CompanionSX, 1 hour 52 minutes. These results illustrate that slight variations between supposedly identical batteries can result in noticeably different times. Extra batteries for the CompuAdd Companion SX and the TI TravelMate cost \$109 and \$129 each, respectively.

Both sets of times are far from the best among our 20-MHz notebooks. Notebooks from Dell, AST, and Compaq lasted more

COVER STORY 386SX NOTEBOOKS

than 2 hours 30 minutes. Recharge time for both the TravelMate 3000 and CompanionSX is 3 hours with the unit off and an agonizing 15 hours if the unit is running. Here too, other notebooks charge a battery faster, but TI claims that the slower-charging unit causes less heat build-up inside the notebook's case.

To their credit, though, these two systems give you a wide variety of battery saving options, including the ability to use a standby mode in *Windows*. Through setup, you can set the screen to blank and the hard disk to spin down at 1- to 10-minute intervals. You can also disable power to the parallel, serial, and mouse ports and the floppy disk drive, though the only way to restore power to these accessories is through the setup program.

The *Windows*-aware standby mode is activated through a keystroke command or by closing the cover, and Texas Instruments claims that the battery can last up to 7 hours in standby mode.

HARD DISK OPTIONS

If you want your notebook computer to double as your desktop computer, the TravelMate 3000 is a better choice. It is available with 20MB, 30MB, 40MB, or 60MB hard disks, but the CompanionSX is available only with 20MB or 40MB hard disks. Both units have a port for connecting to an expansion unit, but neither company offered such a unit at the time of this review.

TI plans to introduce a unit by July that will have three 16-bit slots, three 3.5-inch drive bays, and a port for connecting a full-sized desktop keyboard, but had not yet set a price at the time of our deadline. CompuAdd does not plan to offer an expansion unit. Both CompuAdd and TI offer an optional 2,400-bps modem priced at \$399 and \$499, respectively; it has send-only fax capability.

HIGH-RES CHOICE

The VGA LCD triple-supertwist screen, made by Sharp, measures 6 by 8 inches. The screen is quite readable, and the brightness and contrast controls give you adequate play in adjusting the image. Users of *Windows* and graphics applications will appreciate the screen's ability to support 32 shades of gray at the VGA resolution.

The TravelMate 3000 is also the one to choose if you want to view high-resolution software on an external monitor. The TravelMate 3000 comes with software drivers for a handful of packages, like *Windows* 3.0, that support a maximum resolution of 1,024 by 768. Actually, the video port on both models supports a 1,024 by 768 resolution, but CompuAdd does not supply the necessary drivers. Neither unit allows simultaneous display of an LCD and an external image.

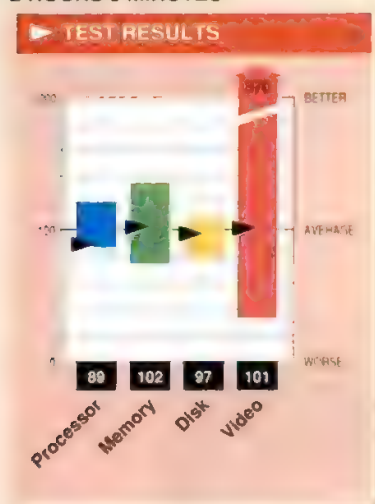
The Alps keyboard comes close to that of a good desktop keyboard. As with all notebook computers, concessions are made to space, but they are kept to a minimum. If most of your keystrokes are numbers, you can add a numeric keypad. But if you want the full eight dedicated cursor-control keys, you'll have to look elsewhere: Alps embeds the PgUp, PgDn, Home, and End functions in the inverted-T cursor keys.

DIFFERENT CHANNELS

Texas Instruments sells through computer dealers, and CompuAdd sells via mail order and its own chain of retail stores. Both companies service the machine if you return it to them. Texas Instruments

CompuAdd CompanionSX

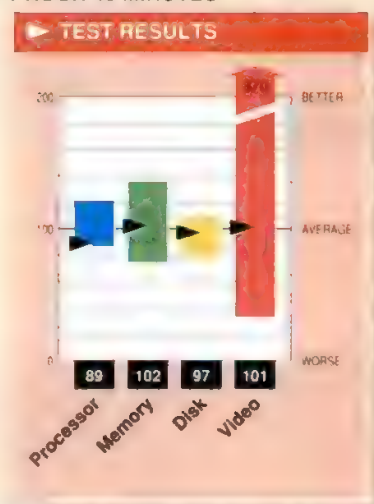
BATTERY RUNDOWN TEST SCORE:
2 HOURS 5 MINUTES



In Short: Like the 5.9-pound 20-MHz TI TravelMate 3000, the CompuAdd CompanionSX has quality construction, excellent components, and low weight, but these attractions are offset by weak performance scores. Yet the CompanionSX's battery life was more respectable—2 hours 5 minutes—though still a far cry from the over-3-hour times yielded by the Dell and Toshiba. Its price is lighter, too, at \$2,999, which is even lower than TI's.

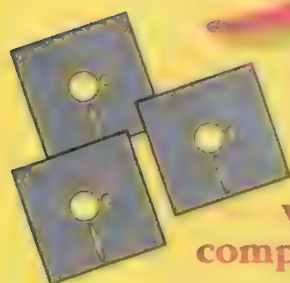
TI TravelMate 3000

BATTERY RUNDOWN TEST SCORE:
1 HOUR 46 MINUTES



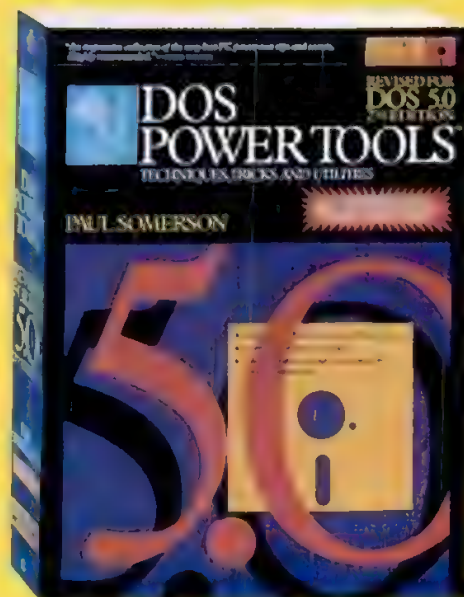
In Short: At 7.3 pounds including AC adapter (5.9 without), the 20-MHz TI TravelMate 3000 should have it all, but weak performance numbers and relatively short battery life (1 hour 46 minutes) offset its quality construction and bright screen. Fortunately, now that Texas Instruments has cut the list price from \$5,499 to \$4,199, the system has become more competitive, though you may have a harder time getting generous dealer discounts.

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CIRCLE 472 ON READER SERVICE CARD

BEYOND 386SX

From higher technology to lower, the portable PC market keeps growing.

Here's a glimpse of the rest of the laptop world.

by Henry Fersko-Weiss

Though manufacturers and users have adopted the 386SX platform as their favorite, other categories are alive and well. Laptops using Intel's 386SL and 486SX microprocessors will arrive by fall, and advances in video systems and the use of communications will play a more prominent role in the market. Even the lowly 286 notebook category has shown activity—if only as an entry-level platform for students and some users on a budget.

Last October Intel Corp. announced a new 386 microprocessor called the 386SL, and by the end of the year at least half a dozen vendors (including Zenith, Compaq, Grid, NEC, Toshiba, and Twinhead) expect to ship at least some units.

The 386SL is similar to the 386SX chip but is highly integrated and incorporates a number of power management capabilities. At least initially, the 386SL will run at 20 MHz. Because the chip is so highly integrated, Intel says manufacturers can shrink the motherboard by 40 percent—though early 386SL system prototypes have the same dimensions as the 386SX notebooks.

SUSPENDED ANIMATION

The real advantage of the 386SL lies in its power-management tricks. A suspend/resume feature lets users keep their place in an application—even in protected mode—after the computer has been turned off. Actually, these computers never shut down completely; instead, they enter a suspended animation in which the CPU powers down to 0 MHz and memory is peri-

odically refreshed. Intel says users could open several applications and data files in *Windows*, turn the computer off, then return to the same point two weeks later. The 386SL can also rest between keystrokes to conserve power. Intel says the combination of these features should double the usable battery life of a notebook, making 8-hour battery life conceivable.

Zenith and Twinhead have taken the lead in development of the 386SL, and both promise to be shipping at least small quantities by September. The Zenith model, called the MastersPort 386SL, weighs 6.8 pounds and comes standard with 2MB of RAM (expandable to 8MB), a 60MB hard disk, and an internal 1.44MB floppy disk drive for somewhere between \$5,499 and \$5,799.

Twinhead's version, called the Supernote 20C, weighs 6.5 pounds and comes standard with 2MB of RAM (expandable to 8MB), 32K of processor RAM cache, a 40MB hard disk, and an internal 1.44MB floppy disk drive for around \$4,000. Most of the systems in this class will have a price premium of \$1,000 to \$1,500 over most SX notebooks.

POWER SOLUTIONS

Till now, the power user's only portable computing solution was to lug around a 20-pound lunchbox with a 386 chip inside—or perhaps IBM's portable 486, the Model P90. But Intel's inexpensive 486SX chip, with its 32-bit architecture and 20-MHz clock speed, will soon find its way into another new generation of laptops. They won't be as compact as the notebooks in this review, but they won't be the behemoths that once passed for portables, either.

Zenith and Twinhead also plan to start shipping 486SX laptops by the beginning of 1992. Called the SuperPort 486SX and the Superlap 420, respectively, these 20-MHz computers (equipped with the 486SX's internal 8K cache and 32-bit architecture) will weigh in the range of about 10 to 13

pounds but surprisingly, will still run on batteries—a departure from most earlier-generation 386 portables.

Wireless communications, too, will make these machines more appealing to power users. The AT&T Safari NSX/20 notebook (which arrived at *PC Magazine* too late to be tested for review) has taken the lead with an optional receive-only wireless messenger (\$350). This pocket-sized unit plugs right into the serial port and permits the Safari to download and display up to 14 pages of messages.

The second generation of the Safari, due out sometime this fall, will offer an on-board fax/modem that can connect to cellular circuits; it transmits data at 2,400 bps and faxes at 9,600 bps. AT&T and others are working toward radio-frequency (RF) and cellular fax/modems that will give laptops total portability.

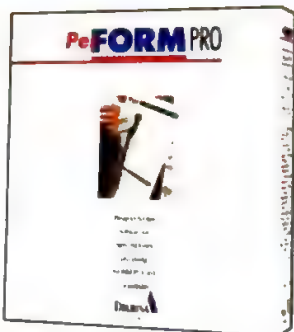
R.I.P. 8088

The rapid change in the laptop field has rendered the 8088 laptop market obsolete and made the 286-based models look antiquated. A few manufacturers are still introducing 12-MHz and 16-MHz 286 notebooks but targeting them at the price-sensitive end of the market: home office users, students, and salespeople who don't make field presentations.

One ambitious vendor—Dauphin Technology—has both ends of the market covered. The Dauphin 1000 Lapbook can be upgraded from a 286 processor all the way up to a 486DX. A 286 configuration with 1MB of RAM and a 20MB hard disk costs \$2,295. Other vendors, such as CAF Technologies, Gold Star, Librex, Olivetti, Packard Bell, Panasonic, and SAI have introduced 12-MHz or 16-MHz notebooks to cover the entry level. SAI's version even weighs less than 5 pounds, with a 40MB hard disk and an internal floppy disk drive. Nevertheless, analysts predict that 286 sales will continue to wane in favor of the more powerful, *Windows*-ready 386SX notebook platform. ■

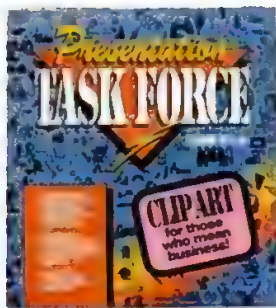
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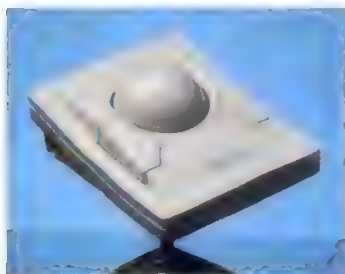
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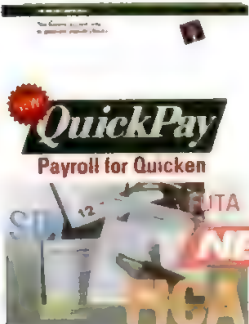
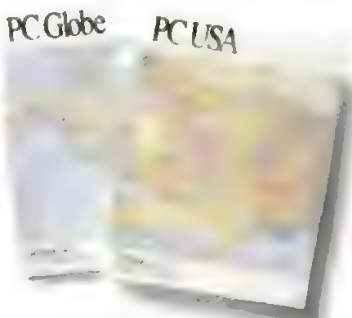


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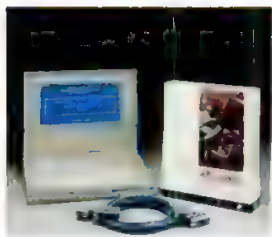
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FN0264	Money Matters	51
FN0215	One-Write Plus Acct. System	170

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★ Win Connect
(Traveling Software) This handy utility enables you to access your laptop from your desktop. Share, transfer and manage your files within any Windows program. Includes hDC's File Enhancer. **UT2014 \$65.**

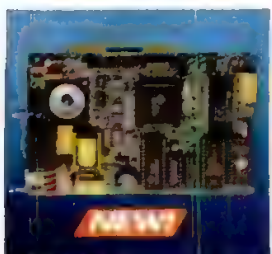


★ hDC FileApps
(hDC Computer Corp.) hDC FileApps is a set of five powerful MicroApps (pop-up utilities) that lets you delete files, view your disk usage, search for files, encrypt files and share transfer files—all without ever leaving your Windows program. **UT1944 \$69.**



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ProModem 24/96BSR
(Prometheus) 2400 bps data modem with 9600 bps send/receive fax. Supports 4.42bis/MNP-5 data compression and error correction. Software package includes Windows fax software. **MM0810 \$209.**



M-6000CG ColorArtist Scanner w/OCR

(Marstek) Marstek has combined color and true gray scale scanning technology together. Scan at 200 DPI and capture up to 262,144 colors in super color mode. In the mono mode, you can capture images at 400 dpi with 64 gray scales. Now bundled with ScanKit Color Utility S/W, Rainbow Paint S/W and Perceive OCR. **IN2070 \$499.**

hDC Computer Corp.

UT1944 ★ FileApps 69.
UT1634 ★ FirstApps 49.
UT0644 ★ Windows Express 3.0 49.

Helix

BS3154 ★ NetRoom Single User 49.
BS3134 ★ NetRoom 4 User 91.

Hewlett Packard

BS2783/5 ★ New Wave 3.0 125.

Informix

BS2283/5 ★ Wingz for Windows and OS/2 329.

Insight Resource

BS3423/5 Ko-Pilot for Lotus 1-2-3 79.
BS3413/5 Ko-Pilot for WordPerfect 5.1 79.
BS3433/5 Ko-Pilot for WordPerfect 5.0 79.

Inner Media, Inc.

UT1754 ★ Wide Angle 65.

Inset Systems

UT1614 HiJaak 2.0 99.

Multisoft

UT0554 PC-Kwik Powerpack 2.0 70.

NBI, Inc.

WP0554 ★ Legacy 298.

No! Press

BS0124 Willmaker 4.0 36.

Norton-Lambert

CM0143/5 Close-Up Customer/Terminal 3.0 129.

CM0434 Close-Up LAN 550.

CM0153/5 Close-Up Support/ACS 3.0 159.

Numbers & Co.

UT2125 Whiskers 3.01 19.

Okna Corporation

BS3124 ★ Desk Top Set 85.

Peachtree Software

FN0233/5 Peachtree Complete III 5.0 145.

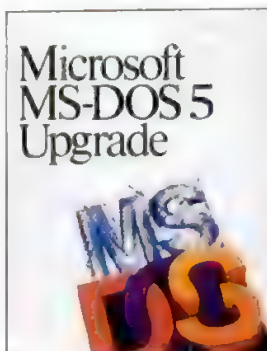
FN0253/5 Peachtree Cmpl. III Bonus Bdl 219.

Polaris

BS2894 ★ PackRat 3.0 259.

Microsoft MS-DOS 5 Upgrade

(Microsoft) Announcing the long awaited MS-DOS 5 Upgrade. The new version gives your applications more memory by loading MS-DOS into extended memory and allowing you to load network software drivers and TSR's into the upper memory area. Extremely easy and safe to install on your current system. **OP0113/5 \$99.**



Intuit

FN0164 Quicken 4.0 37.

FN0434 QuickPay Call.

Jacoby & Meyers Law Offices

BS2923/5 WillPower 32.

Lotus

BS3174 Agenda 2.0 288.

GR0864 Ami Pro 1.2 305.

BS1473/5 Lotus 1-2-3 Rel. 2.2 339.

BS2654 Lotus Works 1.0 95.

BS2433/5 ★ Lotus 1-2-3 Rel. 3.1 419.

BS2323/5 Symphony 2.2 519.

Magee

UT0844 AutoMenu 38.

Meca

FN0243/5 Managing Your Money 7.0 135.

Merrill & Bryan Enterprises

UT0994 InfoSpotter 2.5 50.

UT2034 Remote Rx 69.

UT1654 ★ Turbo EMS 6.0 56.

Microcom

CM0453/5 Carbon Copy Plus 6.0 115.

Micro Logic

BS2144 InfoSelect 70.

Microrim

BS3493/5 Personal R-Base 75.

Microsoft

OP0113/5 DOS 5.0 Upgrade 59.

BS3254 ★ Excel for Windows 3.0 319.

BS2723/5 ★ Office for Windows 649.

BS2733/5 ★ Productivity Pack 42.

BS2704 ★ Project for Windows 1.0 455.

BS2253/5 ★ Windows 3.0 90.

BS1954 ★ Windows Developer's Tool Kit 329.

WP0043/5 Word 5.5 209.

WP0374 ★ Word for Windows 1.1 319.

BS0173/5 Works 2.0 95.

Precision Software

BS1874 ★ Superbase 4 Windows 425.

Prisma Software

UT1044 ★ Your Way 119.

QMS

BS1624 ★ Ultrascript PC Plus 2.1 279.

Qualitas

UT0683/5 386Max Professional 5.1 75.

UT1673 BlueMax 89.

Quarterdeck Office System

BS0163/5 DESQview 386 2.3 79.

EX1103/5 ★ QEMM 386 5.1 61.

Que Software

WP0544 RightWriter 4.0 55.

Reality Technologies

FN0124 Wealthbuilder 1.1 139.

FN0334 WealthStarter 35.

Reference Software

WP0334 Grammatik IV 2.0 57.

Kensington Laser Stand

(Kensington) Announcing a space saving printer stand designed to aesthetically match the HP Laserjet II and III and similar printers. Conveniently holds and organizes paper cassette trays, extra reams, envelopes and other printer accessories including font cartridges. Also featuring a unique cable management system which hides and protects power and network cables. **AC3740 New.**



WP0514	★ Grammatik Windows	55.
Round Lake Publishing		
WP0523/5	Letterworks	59.
WP0573/5	Sales Letterworks	59.
Sea, Inc.		
UT2114	Arc-Plus 7.12	65.
Server Technologies, Inc.		
CM0454	Power On/Off	199.
SitBack Technologies		
BS3553/5	★ SitBack for Windows	85.
Softlogic Solutions		
UT0073/5	Disk Optim. Tools w/ Data Guard.	39.
Software Directions		
UT1914	★ Print Q 5.0	85.
UT0884	PrintQ LAN	295.
Software Products International		
BS2863/5	★ Access SQL	949.
BS2873/5	Open Access III	425.
Software Publishing		
WP0463/5	Professional Write 2.2	165.
WP1523/5	★ Professional Write Plus	169.
Software Ventures Corp.		
CM0314	★ MicroPhone II for Windows	229.
Spinnaker Software		
BS1923/5	BetterWorking Eight-In-One	35.
BS1134	The Resume Kit	29.
Symantec		
WP1573/5	★ Just Write	129.
UT1694	Norton AntiVirus 1.0	85.
UT0054	Norton Util. Advanced 5.0	115.
BS0653	Q&A 4.0	235.
UT1604	The Norton Backup 1.2	99.
BS3723	On Target 1.0	265.
Symantec/Helix		
BN0024	Norton Util. w/ Netroom Bundle	134.
Teleware		
FN0414	★ M.Y.O.B.	135.
ThredZ Software Design Group Inc.		
UT1804	★ ThredZ File F/X	75.
Timeslips Corp.		
BS0133/5	Timeslips III 4.0	189.
Touchstone		
UT0734	Check It! 3.0	85.
Traveling Software		
UT0394	Laplink II	89.
UT2014	★ WinConnect	65.
Trend Micro Devices		
UT1964	PC-Cillin Virus Immune System	99.
Verilsoft		
UT0904	Double Disk	65.
WestCliff Software		
WP1504	DosAmigos	99.
WordPerfect Corp.		
WP0363/5	WordPerfect 5.1	249.
WP0504	LetterPerfect 1.0	135.
WordScience		
WP0483/5	Definition Plus	69.
WordStar U.S.A.		
WP0634	WordStar Legacy	269.
XTree Company		
UT1874	XTree Go d.2.0	95.

LANGUAGES

Asymetrix		
LN1454	★ Toolkit	299.
Borland International		
LN1654	Borland C++ 2.0 Prof.	335.
LN1664	★ Object Vision for Windows	95.
LN0023/5	Turbo C++	69.
Microsoft		
LN0074	C Compiler 6.0	319.
LN0043/5	QuickC 2.5	69.
Nantuckel		
LN1444	Clipper 5.01	519.
Solution Systems		
LN0433/5	Brief 3.1 for DOS	179.
Spinnaker Software		
LN1464	★ Spinnaker Plus	279.



Good craftsmanship and competitive pricing make the CompuAdd CompanionSX and the TI TravelMate 3000 (shown here) serious players in this roundup.

services the TravelMate 3000 at repair sites across the country, and CompuAdd repairs the CompanionSX at its retail locations. Both companies offer one-year warranties on parts and labor. CompuAdd and Texas Instruments have technical support lines, but only CompuAdd's is toll-free. If you own a Texas Instruments machine and need help, however, the sting of a big phone bill is lessened because after you explain your problem, a TI technician calls you back at TI's expense. Texas Instruments and CompuAdd offer optional on-site service for \$156 and \$90 per year, respectively.

The Texas Instruments TravelMate 3000 and the CompuAdd CompanionSX feature quality components and solid construction that should stand up well to the rigors of life on the road. Deciding if either is right for you hinges on whether the light weight or long battery life is more important to you. If weight is the key factor, these 5.9-pound units are among the lightest 386SX-based notebooks you can buy. But if you're willing to carry a pound or so more computer, units such as Dell's System 320N and Compaq's LTE 386s/20 offer considerably longer battery life.

DATAWORLD NB-320SX TANDON 386SX-20

by Patrick Honan

On the outside, the NB-320SX and 386SX-20 are identical twins. They are the same color, have the same power switch, ports, and floppy disk drive—all located in the same places. Both units weigh 7 pounds with the battery installed and 8.6 pounds when you add the AC power adapter. With a carrying case and a couple of cables, these twins reach 10 pounds apiece—a bit heavy. Their 2- by 11- by 8.5-inch dimensions are typical of most notebooks. The motherboard in both units is manufactured by a company called Compal, although Tandon and Dataworld each claim they work independently with Compal on the system design.

The Dataworld unit we tested, with its 20MB, 23-millisecond hard disk, costs \$2,650; the Tandon unit, with a 30MB, 18-ms. hard disk, costs \$3,495. Tandon also offers 30MB and 60MB hard disks, compared with 20MB or 40MB hard disks

Dataworld NB-320SX

Dataworld Inc., 3733 San Gabriel River Pkwy., Pico Rivera, CA 90660-1404; 800-736-3282; 213-695-3777 (in Calif.).

List Price: \$2,650.

Tested Configuration: 2MB RAM, 20MB PrairieTek hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01, *FastLynx*.

Options: 2MB RAM upgrade, \$200; 4MB RAM upgrade, \$400; upgrade to 40MB hard disk, \$300; 80387SX/20 coprocessor, \$360. 2,400-bps modem with MNP 5 data compression, \$145; with send/receive fax, \$295. Extra battery, \$95; AC power adapter, \$95; network adapter, \$370; expansion chassis, \$295; leather carrying case, \$95.

CIRCLE 427 ON READER SERVICE CARD

Tandon 386SX-20

Tandon Corp. North America, 405 Science Dr., Moor Park, CA 93021; 800-800-8850, 805-529-0340; fax: 805-529-8408.

List Price: \$3,495.

Tested Configuration: 2MB RAM, 30MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01.

Options: 2MB RAM upgrade, \$275; 4MB RAM upgrade, \$650; upgrade to 60MB hard disk, \$500; 80387SX/20 coprocessor, \$369. 2,400-bps modem, \$179; with send/receive fax and MNP 5 data compression, \$299; extra battery, \$59; AC power adapter, \$69; car battery adapter, \$79; expansion chassis, \$299; numeric keypad, \$89.

CIRCLE 402 ON READER SERVICE CARD

in the Dataworld. The Tandon costs \$3,995 with a 60MB hard disk; the Dataworld costs \$2,950 with a 40MB hard disk.

These are mail-order prices and therefore are not likely to be discounted, although Tandon also sells the 386SX-20 through computer retailers. Dataworld bundles *FastLynx* and its cables. Both computers include a carrying case with room for the computer but not the AC adapter. Tandon's case is leather (Dataworld's is nylon), and Tandon also includes a second leather case with room for a power adapter, disks, and paperwork. A similar case from Dataworld is a \$95 option.

Both computers support up to 16MB of SIMM-based RAM. That's roughly three times as much RAM as many other notebooks in this roundup support and a significant advantage if you're looking to run OS/2, *Windows*, or other memory-hungry applications. The SIMMs are a snap to install. You simply remove a panel just above the left side of the keyboard and snap them into the sockets. Both manufacturers concede that there were occasional problems addressing the full 16MB with Phoenix BIOS, Version 1.01, origi-

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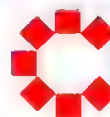
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- MOSAIC - visual file manager
- WFNBOSS - typeface converter



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nally found in both tested units, but the new BIOS versions should resolve those problems.

You can install an internal modem in a slot next to the SIMM sockets. It is accessed by removing the same cover that protects the SIMMs. Tandon and Dataworld offer a 2,400-bps modem (\$179 and \$145, respectively), as well as a modem with send/receive fax capability (\$299 and \$295).

The touch and construction of the keyboard is good, but the placement of keys leaves a lot to be desired. For example, the CapsLock key is at the far left of the bottom row, where you can all too easily hit it with your palm as you type. Those accustomed to the typical position of the Backslash key on the top row of most desktop keyboards will have to adjust to its position in the bottom row on these notebooks. There are four dedicated cursor keys arranged in an inverted-T layout. When used in combination with the Fn key, they serve as PgUp, PgDn, Home, and End.

COVER STORY

386SX NOTEBOOKS

Even identical twins differ beneath the skin; the Dataworld NB-320SX and the Tandon 386SX-20 are no exception.

The backlit LCD screen on both units is from Sharp and uses a Cirrus chip set; it was bright and easy to read at a variety of viewing angles. The viewable display is 5.2 by 6.9 inches and supports 16 shades of gray at its maximum VGA resolution. In addition, you can send the video signal to an external monitor.

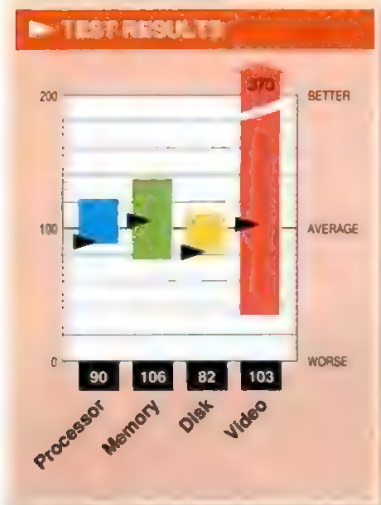
Neither computer can charge the battery while running on AC power. Standby mode was disabled in both tested models but is available in models shipping with the new BIOS versions, according to both manufacturers.

Dataworld and Tandon offer an optional expansion chassis, priced at \$295 and \$299, respectively, that connects to an expansion port on the back of the computer. The expansion unit has three 16-bit slots and a 62.5-watt power supply. Plug a full-size keyboard and VGA monitor into the built-in keyboard and VGA ports, and you have virtually all the functionality of a desktop computer. Other standard ports include one parallel and two serial ports.

A one-year parts-and-labor warranty covers each unit; both Tandon and Dataworld offer toll-free technical support. Dataworld's support hours are 7 A.M. to 6 P.M. weekdays and 9 A.M. to 3 P.M. on Saturdays, P.S.T., but can't compete with Tandon's 24-hour-a-day, 365-day-a-year support.

Dataworld NB-320SX

BATTERY RUNDOWN TEST SCORE:
1 HOUR 42 MINUTES



In Short: At \$2,650, the 7-pound NB-320SX is priced lower than its Tandon double, though it comes with 20MB, not 30MB, of storage capacity. This notebook includes a bright VGA LCD and space for an internal modem. Look elsewhere if you need serious performance and long battery life: Dataworld was third-slowest among all our machines on disk performance and fourth from the bottom in battery life, yielding only 1 hour 42 minutes.

SKIN DEEP

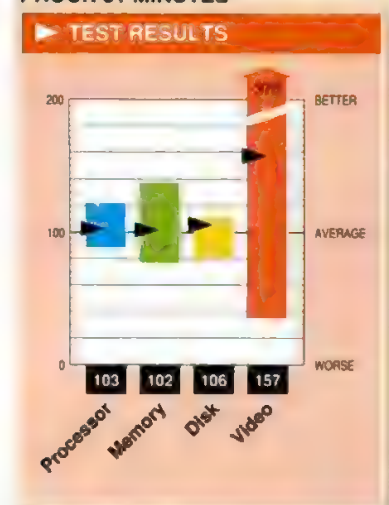
As similar as these machines appear, even identical twins differ beneath the skin; the Dataworld NB-320SX and Tandon 386SX-20 are no exception. For example, Tandon now uses a BIOS of its own design which it says delivers faster performance and allows for more efficient use of the battery. We were able to run the benchmark tests on the 386SX-20 with the new BIOS and found the most significant improvement was in writing directly to the screen in the video performance test, where it took 2.58 seconds to complete the test.

Dataworld has also upgraded its BIOS, offering Phoenix version 1.16; however, this change came too late to be tested at PC Labs. Among the capabilities that Dataworld's new BIOS provides is the ability to turn off the beeping when the battery is running low, useful when using the computer in a public setting, and the ability to boot the PC in either inverse or regular video modes. Both Dataworld and Tandon say they will upgrade the BIOS if a user has the old version.

Battery-management features are largely the same in both units. Tandon claims a longer battery life—3 hours 30 minutes compared with Dataworld's claim of 2 hours 20 minutes. In the battery rundown test, the Tandon lasted 1 hour 54 minutes; the Dataworld, 1 hour 42 min-

Tandon 386SX-20

BATTERY RUNDOWN TEST SCORE:
1 HOUR 51 MINUTES



In Short: A new BIOS implementation gives the 20-MHz Tandon 386SX-20 an edge over its Dataworld sibling. Although its 1-hour-51-minute battery life was only a few minutes better than the Dataworld's, its 30MB hard disk was the fastest in our roundup. The Tandon can also hold up to 16MB RAM on its motherboard and has space for an internal modem.

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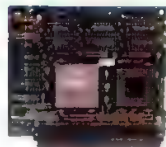
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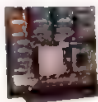
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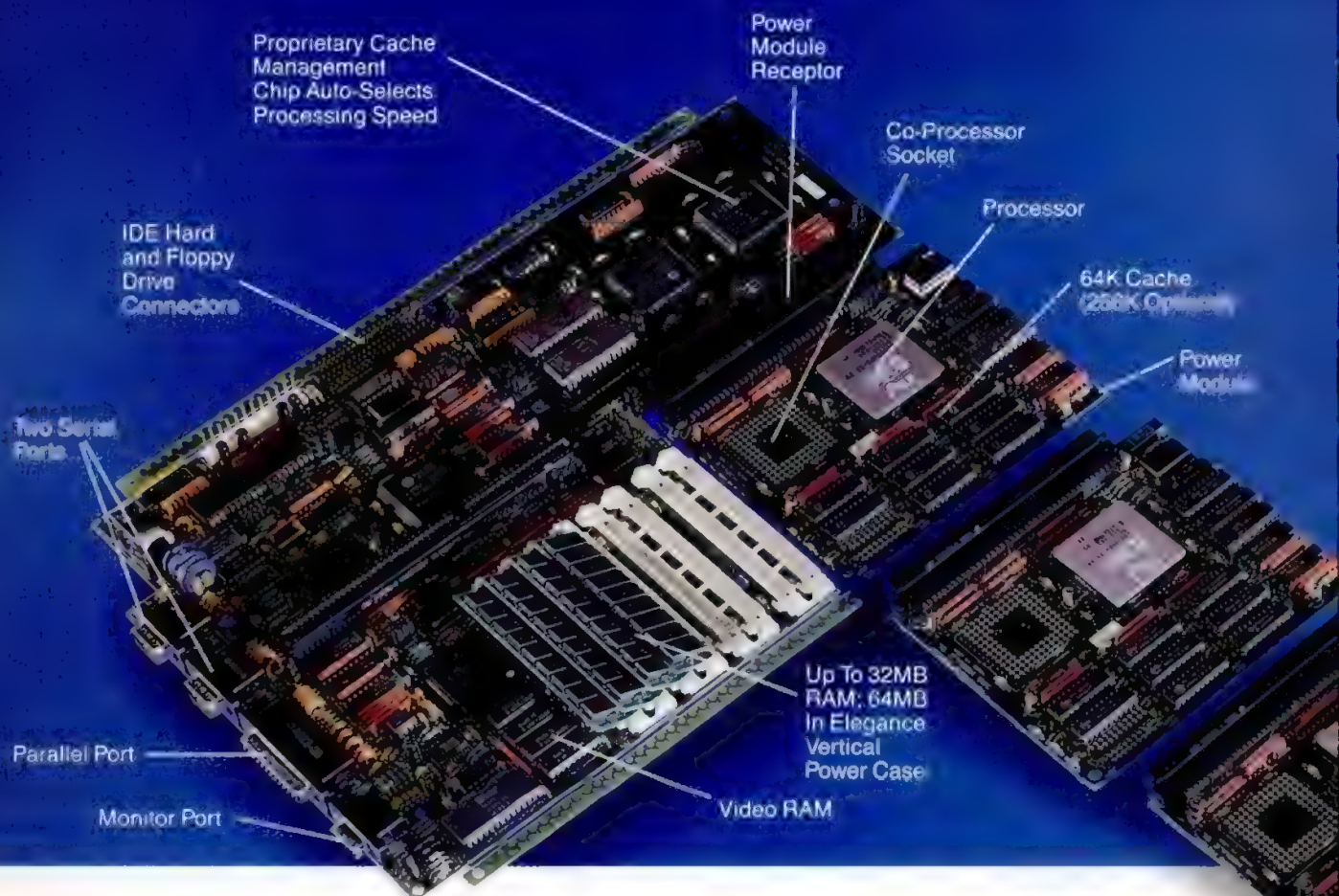


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The challenge facing our R&D department was: Create a total system concept that makes on-site upgrading fast and affordable while maintaining award-winning Northgate performance.

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Three Platforms, five Power Modules ... fifteen systems in all! Northgate has an SP system to meet every application. Start by selecting the platform you need. Space-saving SlimLine, full size

Elegance Desktop, or for use as a file server choose the Elegance Vertical Power platform. All three accept any of the five power modules: 386/25, 33, 40, 486SX/20 and 486/33 MHz.

100% field upgradable ... dollars back, too! Some others make you send your system back for upgrading. What a time waster! Northgate SP systems can be upgraded right in your office or home. You can even do it yourself with just a screwdriver (detailed instructions provided). Want a coach? Call Northgate Tech Support any time day or night. (We're here 24 hours a day, 7 days a week.) One of our experts will guide you through it. Phone call and service are free! *And anytime you upgrade, we'll pay you real dollars for your old module!*

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Northgate Upgrade Price: \$999.00! That's right. You can soar all the way from a 386/33 to a 486/33 for only \$999.00 with processor trade in.* Now lets take a look at what the other guys charge. Ready for an eye-opener?

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- Microsoft® Windows™ and mouse
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- 2MB of RAM on motherboard; expandable to 32MB in Desktop, 64MB in Vertical Power Case
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- 1.44MB 3.5" floppy disk drive (1.2MB 5.25" optional)
- 16-bit SVGA adapter
- Desktop Case with 200 watt power supply and room for three exposed and two internal half-height devices; OR Vertical Power Case with 220 watt power supply and room for three exposed and four internal system half-height devices
- 7 expansion slots
- One parallel and two serial ports
- Intel and Weitek math coprocessor support
- *OmniKey* keyboard
- MS-DOS 3.3 or 4.01 and GW-BASIC or MS-DOS Version 5 and QUICKBasic installed
- QA Plus Diagnostic and utility software
- Microsoft® Windows™ and mouse
- FCC Class B certified

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Elegance Desktop SP Platform **\$2199⁰⁰**

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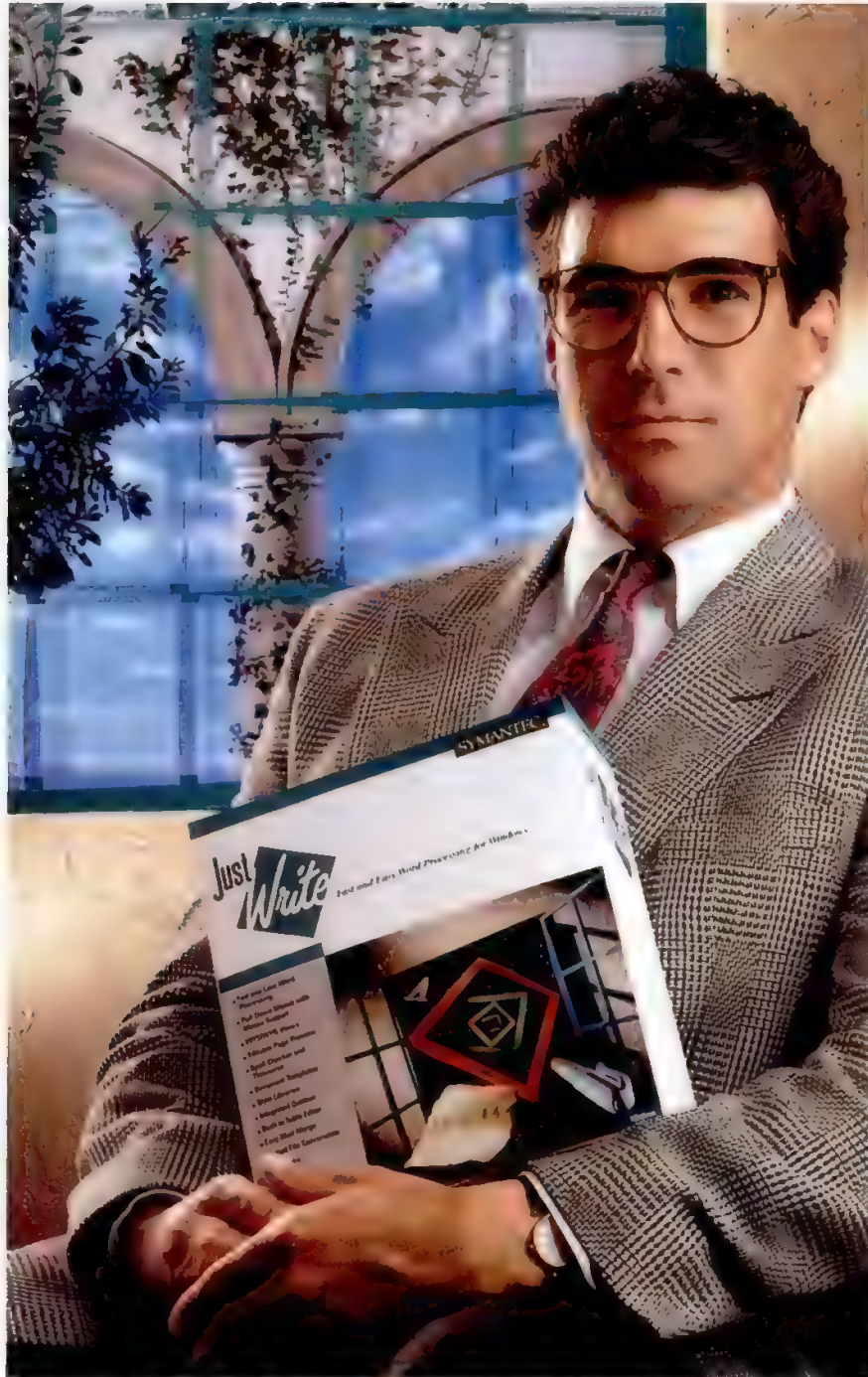
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CIRCLE 173 ON READER SERVICE CARD

386SX NOTEBOOKS



The Dataworld NB-320SX (shown here) and the Tandon 386SX-20 cannot be recharged while in use.

Although these notebooks don't come with some of the more advanced features found on other notebooks in this roundup—like the ability to recharge the battery while operating on AC power—they give you all the basic functionality you need for hundreds of dollars less than many other notebooks.

DELL System 320N

by Edward Mendelson

Dell keeps getting it right. Its new Dell System 320N is a 6.4-pound notebook with exceptional power-management capabilities plus a screen and keyboard that are a pleasure to work with. For \$3,782 Dell hands you a computer with a 20-MHz 80C386SX processor, 40MB hard disk, sidelit VGA LCD, a 1.44MB floppy disk drive, 2MB of RAM, a lightweight (0.9 pound) external power supply, DOS 4.01, and a stylish nylon case. The whole package feels economical, luxurious, and easy to manage. And the System 320N's battery rundown time of over 3 hours was by far the best among 20-

MHz notebooks using nickel cadmium technology. It was beaten only by Toshiba's 16-MHz T2000SX, which uses nickel hydride batteries. Dell's scores in disk and video tests were notably better than average, as well.

Someday notebook computers with hard and floppy disk drives will fit into a case a lot smaller than Dell's 2- by 11- by 8.5-inch model, but this machine is as close to today's practical limits as you can get. Dell assumes that if you buy a powerful notebook, you intend to use it powerfully, so the standard IDE hard disk shipped with the 320N holds 40MB of data. PC Magazine Labs tested a configuration that Dell had equipped with an optional 60MB hard disk (a \$300 upgrade). Add 2MB more of RAM, a math coprocessor, and an optional \$399 2,400-bps modem/fax board (an optimal configuration, according to Dell), and this package costs \$5,079, including DOS 4.01.

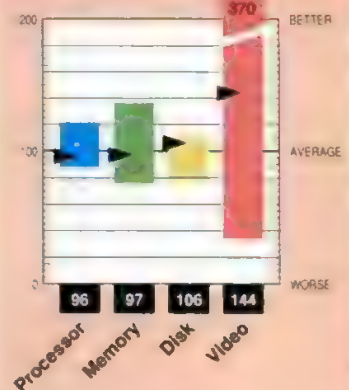
POWER FLEXIBILITY

Dell's fast-responding screen has a usable area of 5.2 by 6.9 inches. In addition to the usual sliders for controlling contrast and brightness, you can use the keyboard to switch to reverse video, enhance contrast

Dell System 320N

BATTERY RUNDOWN TEST SCORE:
3 HOURS 1 MINUTE

TEST RESULTS



In Short: The Dell System 320N leads the 20-MHz field in battery life, with just over 3 hours of power. It holds a 30MB or 60MB hard disk and a modem and weighs under 8 pounds, including the AC adapter. Power-saving controls let you put the machine to sleep for up to 12 hours without losing data. A full if slightly squashed keyboard, bright sidelit screen, and one-year on-site replacement service make this an ideal road machine.

in *Windows* and other graphics applications, or switch between the built-in monitor and an external VGA (though you can't display on two monitors simultaneously). The key combinations that trigger these changes—for example, Ctrl-Alt-Backspace to toggle reverse-video mode—aren't likely to conflict with applications, and all can be disabled via the well-designed setup program.

The reasonably quiet 85-key keyboard has excellent tactile feedback, an inverted-T cursor pad in the front right corner, and a full set of dedicated direction keys. You should note, however, that Dell has made this keyboard slightly smaller, width-wise, and that may take some getting used to. Function keys across the top are two-thirds the size of the alphabet keys—larger and more convenient than the miniature buttons used on other notebooks. The embedded numeric keypad can be supplemented by a \$149 external keypad.

Dell's exemplary power-management capabilities let you switch the machine into standby mode through a convenient



386SX NOTEBOOKS: SUMMARY OF FEATURES

Price of standard configuration To facilitate comparison, we are citing prices for similarly equipped machines. The standard configuration for our 27 386SX notebooks includes 2MB or 3MB of RAM, a 20MB hard disk or greater, a VGA display, an A/C power adapter, and DOS 3.3 or 4.01. See each machine's fact file for a more exact indication of what is included for the quoted price.

Distribution channel Some machines are sold directly through mail order. When machines are sold by dealers, the purchaser may find discounts of 25 to 30 percent off the list price (although there is no guarantee that the discounts will run this high).

Weight includes the notebook and its battery.

Motherboard manufacturer Some machines are based on motherboards made by major manufacturers, although their other components may vary.

Chip set manufacturer indicates which company makes the logic that connects the CPU with the other functions supported by the system board. Chip sets that use VLSI (very large scale integration) technology reduce the discrete component count, which in turn helps reduce power consumption and increase component life.

The **BIOS version** can affect PC Magazine Labs' benchmark test results. A machine with a different BIOS may perform differently.

Video shadowing/System shadowing Shadow RAM is a technology that loads system BIOS and/or video BIOS from slower ROM into faster RAM on boot-up. Shadowing uses RAM located between 640K and 1MB.

RAM (minimum-maximum) indicates the amount of memory that can be installed in the unit.

RAM cache options A RAM cache acts as a bridge between the CPU and the slower main memory, to eliminate wait states. The cache comprises a small bundle of fast static RAM (SRAM) chips. To date, only Compaq incorporates a processor RAM cache into its notebook design.

Proprietary expansion port Some machines have an expansion port that enables the system bus to be connected to external devices such as an expansion station or external floppy disk drive.

Bus speeds Most PCs and portables run their system (expansion) buses at 8 MHz. Faster speeds may cause compatibility problems with peripherals.

Expansion slots refers to machine-specific slots most commonly used for modems and memory modules. Sometimes the slots can also be used for network adapters or fax modems. **User-accessible** means that the user can add cards to this slot rather than shipping the unit to the dealer or manufacturer for adapter installation.

Price of expansion unit An expansion unit, also called a docking station or expansion station, provides additional space for standard expansion cards and hard disks, tape drives, or floppy disk drives.

Screen manufacturer Most vendors use liquid crystal displays they have purchased from the original equipment manufacturers.

Gray scales at maximum resolution indicates how many shades of gray the unit can display in VGA mode.

Chip set manufacturer describes who makes the video logic that drives the LCD screen and any external monitor hookup.

Simultaneous external display A yes answer means that an external monitor can be connected without blanking the portable's flat-panel display. This is useful for small-group demonstrations.

Keyboard The keyboard section shows the total number of keys, the number of function keys (10 or 12), and the number of cursor keys (4 or 8). If you have only four cursor keys and you need to access PgUp, PgDn, Home, or End, you must hold a function key and tap one of the arrow keys—an inconvenient extra step. We also indicate whether the notebook has an external numeric keypad connector and an external keyboard connector.

Software The availability and price of DOS 3.3 and 4.01 are indicated here, as well as any other software bundled with the system. If no price is shown, the base-priced system includes the listed software. (PC Magazine's standard configuration includes DOS 4.01—or, if it is not available, DOS 3.3x—to allow more-accurate price comparisons.) Where OS/2 is available, the version number and list price are given.

Modem type indicates the speed and, where applicable, the compression scheme of the vendor's preferred modem (a data modem except where otherwise specified). Modems that function at 2,400 bits per second and faster benefit from built-in error correction. *MNP 5 compression* is the most widespread form of data compression in use today; it includes MNP 2 through MNP 4 error correction. *V.42 error correction* is an emerging standard, as is *V.42 bis compression*, which includes V.42 correction. Whenever possible, you should strongly consider MNP 5 compression as a minimum requirement.

Power supply wattage and voltage The output wattage of each unit's power supply is given; this specification is important for those adding peripherals. If a machine has *dual voltage*, a switch (usually automatic) on the power supply permits use with both 110- and 220-volt current.

Rated battery life is the vendor's rating, in hours, for the internal battery or batteries. PC Magazine Labs independently measures battery life; the results appear as **tested battery life**.

Voltage and Amp-hours We report the voltage of the notebook's internal battery, as well as how many amperes the battery can sustain for 1 hour.

Rated battery life in standby mode describes how long a notebook will keep the contents of RAM when standby mode is invoked. Manufacturers' claims range from 2 hours to 6 days.

Shutdown: display/disk and system/peripherals involves automatically dimming or blanking the display, turning off the hard disk (now common to most portables), slowing or halting the CPU, and removing power from I/O ports (modem and serial ports) when the machine is not in use.

The **transformer weight and size** can vary significantly among machines with similar power needs.

FCC Class B Identification number The number assigned by the Federal Communications Commission can be used to establish that an electronic device has sufficiently low radio-frequency emissions to be used in the home. All of these notebooks have Class B certification, as required for portable PCs; the less stringent Class A rating restricts devices to the office. To verify any system's status, you may dial up the Public Access Link, the FCC's own bulletin board service. The phone number is 301-725-1072.

CONTINUES



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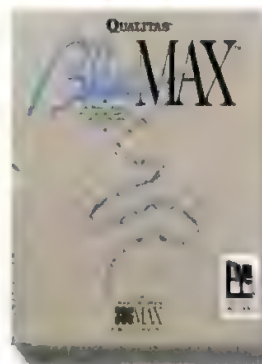
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*Offer valid in North America only.

CIRCLE 258 ON READER SERVICE CARD

COVER STORY

386SX NOTEBOOKS

386SX NOTEBOOKS: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	ALR Venture/16	AST Premium Exec 386SX/20	Automated Computer Technology ACT Tempo 386SX	Bitwise 386SX/16 Notebook	Commax Notebook 386SX	 Compaq LTE 386s/20 Model 30
Price of standard configuration	\$2,795	\$2,995	\$2,845	\$1,995	\$2,994	\$4,399
Distribution channel	Dealers	Dealers	Direct	Direct	Dealers	Dealers
STANDARD CONFIGURATION						
Processor speed, hard disk capacity	16 MHz, 20MB	20 MHz, 20MB	16 MHz, 21MB	16 MHz, 20MB	16 MHz, 20MB	20 MHz, 30MB
Dimensions (HWD, in inches)	2.1 x 12.2 x 8.6	2.3 x 12.4 x 10	2 x 12 x 10	1.9 x 12 x 10.4	2.1 x 12.2 x 8.6	2.2 x 11 x 8.5
Weight (pounds)	7.7	7	6.9	6.9	7.7	7.7
Display area (HxW, in inches)	5 x 7	6 x 7.8	5.3 x 7.5	5.3 x 6.8	5 x 7	5 x 7
Motherboard manufacturer	Nippon	AST	Sanyo	NTC	Nippon	Compaq
Chip set manufacturer	C&T	WD	Oak	Headland	C&T	Compaq
BIOS version (or date)	AMI (7/90)	AST 1.05	Phoenix 1.10	Award (10/89)	AMI (7/90)	Compaq 3B01
Video shadowing/System shadowing	■ / ■	■ / ■	■ / ■	□ / ■	■ / ■	■ / ■
MEMORY AND DISK DRIVES						
RAM (minimum—maximum)	1MB—5MB	1MB—8MB	1MB—5MB	1MB—5MB	1MB—5MB	2MB—10MB
RAM cache options	None	None	None	None	None	4K
Hard disk options	40MB	40MB, 60MB	40MB, 60MB	None	40MB, 60MB	60MB
INPUT/OUTPUT						
Serial, parallel, mouse ports	2, 1, 0	1, 1, 1	1, 1, 0	2, 1, 0	2, 1, 0	1, 1, 1
Proprietary expansion port	■	□	□	□	■	■
EXPANSION BUS						
Bus speeds	8 MHz	8 MHz	8 MHz	N/A	8 MHz	8 MHz, 11 MHz
Expansion slots	1 memory	1 modem	None	None	1 memory	None
User-accessible	■	■	N/A	N/A	■	N/A
Price of expansion unit	N/A	N/A	N/A	N/A	N/A	\$999
VIDEO						
Screen manufacturer	Seiko-Epson	Seiko-Epson	Seiko-Epson	Seiko-Epson	Seiko-Epson	Compaq
Gray scales at maximum resolution	32	32	16	16	32	16
Chip set manufacturer	Cirrus Logic	Cirrus Logic	Cirrus Logic	Cirrus Logic	Cirrus Logic	Compaq
Simultaneous external display	□	□	□	□	□	□
KEYBOARD						
Keys: total, function, cursor	82, 10, 4	82, 10, 8	82, 12, 4	82, 10, 4	82, 10, 4	80, 10, 4
Keypad connector/Keyboard connector	Built-in/built-in	Built-in/built-in	None/none	Built-in/none	Built-in/built-in	Built-in/separate
SOFTWARE						
DOS	DR-DOS 5.0	3.3	4.01	3.3, 4.01	4.01 (\$75)	4.01 (\$150)
Other software	Utilities	Battery Watch, LapLink III, utilities	LIM 4.0, Windows 3.0, utilities	None	None	ADAPT, CACHE, CEMM, PWRCON
MODEM						
Modem type	None	2,400-bps	2,400-bps	None	None	2,400-bps v.42bis
Price	N/A	\$249	\$305	N/A	N/A	\$369
POWER SUPPLY AND BATTERY						
Power supply wattage, voltage	32, dual	18, dual	45, dual	48, dual	32, dual	35, dual
Rated battery life (hours)	3	3	2-3	2.5	3	3
Tested battery life (hours:minutes)	1:58	2:38	2:37	1:58	2:10	2:34
Charge time with unit on, off (hours)	24, 2	12-14, 3-4	8, 1	8, 2	24, 2	3, 1.5
Voltage, Amp-hours	14.4V, 1.8Ah	4.8V, 5Ah	12V, 1.7Ah	8.4V, 2.8Ah	14.4V, 1.8Ah	19.2V, 1.7Ah
Rated battery life in standby mode	N/A	27 hours	N/A	N/A	N/A	No rating
Shutdown:						
Display/disk	■ / ■	■ / ■	□ / ■	■ / ■	■ / ■	■ / ■
System/peripherals	■ / □	■ / □	■ / ■	□ / □	■ / □	■ / □
Transformer weight (pounds)	1.7	1.6	1.8	1.3	1.7	1.5
Transformer size (inches)	2 x 3 x 6.5	2.2 x 3.1 x 6.4	2 x 3 x 8	2 x 3 x 6.5	2 x 3 x 6.5	2 x 3 x 5
MISCELLANEOUS						
80387SX/Weitek coprocessor	■ / □	■ / ■	■ / □	■ / □	■ / □	■ / □
Setup in ROM/Password in ROM	■ / □	■ / ■	■ / □	■ / □	■ / □	□ / □
Warranty	1 year	1 year	1 year	1 year	1 year	1 year
Service	Dealer, vendor	Dealer	Vendor	Vendor	Dealer, vendor	Dealer
FCC Class B identification number	IAK386NT007	DJKASTEXENBK	E3EEX-NB1000	FMA 2200	IAK386NT007	CNT75M-17582-MD-E

■—Editors' Choice ■—Yes □—No

N/A—Not applicable; The product does not have this feature.

C&T—Chips and Technologies Inc., TI—Texas Instruments, WD—Western Digital Corp.

POWERBOOK TEST NOTEBOOKS

CompuAdd CompanionSX	Dataworld NB-320SX	 Dell System 320N	Epson NB3s	Everex Tempo LX	IBM PS/2 L40 SX	Leading Technology PC Partner XL	Micro Express NB5620
\$2,999 Direct	\$2,650 Direct	\$3,548 Direct	\$4,298 Dealers	\$3,299 Dealers	\$6,654 Dealers	\$2,495 Dealers, direct	\$2,224 Direct
20 MHz, 20MB 1.8 x 11 x 8.5 5.9 6 x 8 TI TI Phoenix 1.00 ■ / ■	20 MHz, 20MB 2 x 11 x 8.5 7 5.2 x 6.9 Compal/Dataworld Intel Phoenix 1.01 ■ / ■	20 MHz, 30MB 2 x 11 x 8.5 6.4 5.2 x 6.9 Dell Headland Phoenix 1.01.A02 ■ / ■	16 MHz, 20MB 1.8 x 11.5 x 8.3 5.9 5.3 x 6.8 Seiko-Epson C&T AMI (1/91) ■ / ■	16 MHz, 21MB 2 x 12 x 10 6.9 5.3 x 7.5 Sanyo Oak Phoenix 1.10 ■ / ■	20 MHz, 60MB 2.1 x 12.8 x 10.6 7.7 5.9 x 7.8 IBM IBM IBM (2/91) ■ / ■	20 MHz, 20MB 2 x 11.7 x 8.7 6.7 5 x 7 Chaplet VLSI Tech AMI (8/90) ■ / ■	20 MHz, 20MB 2 x 11.8 x 8.3 7.1 5.4 x 7.5 Chicony Intel AMI (4/90) ■ / ■
2MB-6MB None 40MB	2MB-16MB None 40MB	1MB-5MB None 40MB, 60MB	1MB-5MB None 40MB, 60MB	1MB-5MB None 40MB, 60MB	2MB-18MB None 60MB	1MB-8MB None 40MB	1MB-5MB None 40MB, 60MB
1, 1, 1 ■	2, 1, 0 ■	1, 1, 1 □	1, 1, 0 ■	1, 1, 0 □	1, 1, 1 ■	1, 1, 1 ■	2, 1, 0 □
8 MHz None N/A N/A	8 MHz None N/A \$295	8 MHz 1 modem ■ N/A	8MHz, 16 MHz 1 memory, 1 modem ■ \$699	8 MHz 1 modem □ N/A	8 MHz 1 modem □ N/A	6.6 MHz None N/A \$649	8 MHz 1 memory ■ N/A
Sharp 32 WD □	Sharp 16 Cirrus Logic □	Sharp 16 WD □	Seiko-Epson 16 WD □	Seiko-Epson 16 Cirrus Logic □	Toshiba 32 WD □	Seiko-Epson 16 Cirrus Logic □	Sanyo 16 Cirrus Logic □
79, 10, 4 Built-in/none	81, 12, 4 None/built-in	85, 12, 8 Separate/built-in	82, 12, 4 Built-in/none	82, 12, 4 None/none	84, 12, 4 Built-in/none	80, 10, 4 Built-in/built-in	83, 10, 4 None/none
4.01 None	4.01 FastLynx	4.01 (\$119) None	4.01 None	4.01 LIM 4.0, Windows 3.0, utilities	IBM 4.01 (\$150) EMS Memory Manager	4.01 HyperDOS, utilities	3.3 or 4.01 (\$75) OS/2 1.2 (\$279)
2,400-bps with send-only fax \$399	2,400-bps MNP 5 \$145	2,400/9,600-bps fax modem \$399	2,400-bps MNP 5 \$399	2,400-bps MNP 5 \$329	2,400/9,600-bps data/fax \$659	2,400-bps external Included	None N/A
28, dual 3 2:05 15, 3 4.8V, 5Ah 7 hours ■ / ■ ■ / □ 1.4 2 x 5.8 x 3.3	18.5, dual 2.5 1:42 N/A, 3 5V, 5.2Ah 24 hours ■ / ■ ■ / ■ 1.6 2 x 6.5 x 3	24, dual 3-4 3:01 N/A, 3 8.4V, 3.4Ah 12 hours ■ / ■ ■ / ■ 0.9 1.8 x 3 x 5	17, dual 1.5 1:02 8, 3 7.2V, 1.7Ah 2 hours ■ / ■ ■ / □ 1.2 1.5 x 3 x 7	45, dual 2.5-3 2:38 8, 1 12V, 1.7Ah N/A □ / ■ ■ / ■ 1.8 2 x 3 x 8	40, dual 3 1:52 10, 10 10.8V, 2.4Ah 5 to 6 days ■ / ■ ■ / ■ 1.5 2.3 x 3.1 x 7.3	60, dual 2 1:53 6, 6 9.6V, 2.5Ah No rating ■ / ■ ■ / □ 1.8 2 x 6.9 x 3.3	30, dual 3 2:09 4, 2 10.8V, 1.8Ah 4 hours ■ / ■ ■ / ■ 1.3 1.5 x 3 x 5.8
■ / ■ ■ / ■ 1 year Vendor A92S63T30	■ / ■ ■ / ■ 1 year Phone service GS8TDATA-NC0	■ / □ ■ / ■ 1 year Vendor, on-site E2K320N	■ / □ ■ / □ 1 year Dealer, on-site BKME94501	■ / □ ■ / □ 1 year Dealer, vendor E3EE-XB1000	■ / □ ■ / ■ 1 year Dealer AN08543	■ / □ ■ / □ 1 year (limited) Vendor GXLNBA386SX	■ / □ ■ / □ 15 months Vendor E8HNB5620

CONTINUES

COVER STORY

386SX NOTEBOOKS

386SX NOTEBOOKS: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	Micro Telesis NBA386SX	Modern Computer Walkom NP-903	NMS 80386SX/16 Notebook	Northgate SlimLite	Samsung NoteMaster 386S/16
Price of standard configuration	\$1,699	\$3,500	\$1,874	\$3,299	\$3,698
Distribution channel	Direct	Dealers, direct	Direct	Direct	Dealers
STANDARD CONFIGURATION					
Processor speed, hard disk capacity	16 MHz, 20MB	16 MHz, 20MB	16 MHz, 20MB	20 MHz, 20MB	16 MHz, 20MB
Dimensions (HWD, in inches)	1.9 x 12 x 10.4	2.5 x 12.5 x 9.5	1.9 x 12 x 10.4	2 x 11.5 x 8.5	2.3 x 11 x 8.5
Weight (pounds)	6.9	7.8	6.9	6.2	7.4
Display area (HxW, in inches)	5.3 x 6.8	6.5 x 8.5	5.3 x 6.8	5 x 7	5.3 x 7
Motherboard manufacturer	NTC	Modern Computer	NTC	Northgate	Samsung
Chip set manufacturer	Headland	C&T	Headland	VLSI/Intel	C&T
BIOS version (or date)	Award (10/89)	AMI (1.01)	Award (10/89)	Quadtel 3.05.05	LeAPset (1/91)
Video shadowing/System shadowing	□ / ■	■ / ■	□ / ■	■ / ■	■ / ■
MEMORY AND DISK DRIVES					
RAM (minimum—maximum)	1MB—5MB	2MB—8MB	1MB—5MB	640K—5MB	1MB—5MB
RAM cache options	None	None	None	None	None
Hard disk options	40MB, 80MB	60MB	40MB, 60MB	40MB, 60MB	40MB, 60MB
INPUT/OUTPUT					
Serial, parallel, mouse ports	2, 1, 0	1, 1, 0	2, 1, 0	2, 1, 1	1, 1, 1
Proprietary expansion port	□	■	□	□	□
EXPANSION BUS					
Bus speeds	N/A	8 MHz	N/A	10 MHz	8 MHz, 16 MHz
Expansion slots	None	None	None	1 memory, 1 modem	1 memory, 1 modem
User-accessible	N/A	N/A	N/A	■	■
Price of expansion unit	N/A	\$150	N/A	N/A	N/A
VIDEO					
Screen manufacturer	Seiko-Epson	Sanyo	Sharp	Sharp	Sharp
Gray scales at maximum resolution	16	64	16	32	64
Chip set manufacturer	Cirrus Logic	Cirrus Logic	Cirrus Logic	Cirrus Logic	C&T
Simultaneous external display	□	□	□	□	■
KEYBOARD					
Keys: total, function, cursor	82, 10, 4	83, 10, 4	82, 10, 4	84, 12, 8	80, 12, 4
Keypad connector/Keyboard connector	Built-in/none	Built-in/built-in	Built-in/none	None/built-in	Built-in/none
SOFTWARE					
DOS	3.3 (\$50)	3.3, 4.01	3.3	4.01	4.01
Other software	Windows 3.0	Windows 3.0	None	Windows 3.0	LapLink 3.0, Windows 3.0
MODEM					
Modem type	None	2,400-bps V.22bis	None	2,400-bps MNP 5	2,400/9,600-bps with fax
Price	N/A	\$150	N/A	\$225	\$329
POWER SUPPLY AND BATTERY					
Power supply wattage, voltage	48, dual	60, dual	48, dual	45, dual	16.68, dual
Rated battery life (hours)	3.5	5	2.5	2.5	2.5
Tested battery life (hours:minutes)	2:00	2:52	2:15	1:32	2:23
Charge time with unit on, off (hours)	3, 2	8, 8	3.5, 2	24, 3.5	5, 4
Voltage, Amp-hours	8.4V, 2.8Ah	110/240V, 2.5Ah	8.4V, 2.8Ah	7.2V, 2.2Ah	4.8V, 5Ah
Rated battery life in standby mode	N/A	6 hours	N/A	4–5 hours	24 hours
Shutdown:					
Display/disk	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■
System/peripherals	□ / □	■ / □	□ / □	■ / ■	■ / □
Transformer weight (pounds)	1.3	1.2	1.3	1.3	1.2
Transformer size (inches)	2 x 3 x 6.5	1.8 x 3.3 x 7	2 x 3 x 6.5	1.5 x 2.5 x 5	2 x 5.8 x 3.5
MISCELLANEOUS					
80387SX/Weitek coprocessor	■ / □	■ / □	■ / □	■ / □	■ / □
Setup in ROM/Password in ROM	■ / □	■ / □	■ / □	■ / ■	■ / □
Warranty	1 year	1 year	1 year	1 year	1 year
Service	Vendor	Dealer	Vendor	Vendor, on-site	On-site, vendor
FCC Class B identification number	FMA 2200	GS6NP-903	FMA 2200	GT6NB20	83L53710

☒—Editors' Choice ■—Yes □—No
 N/A—Not applicable: The product does not have this feature.
 C&T—Chips and Technologies Inc., TI—Texas Instruments, WD—Western Digital Corp.

COMPARISON

386SX NOTEBOOKS

Sanyo MBC-16NB	Tandon 386SX-20	Tangent 320N	TI TravelMate 3000	PC Toshiba T2000SX	Twinhead Supernote 386SX	Veridata Execulite 386S	Zeos Notebook 386
\$4,274 Dealers	\$3,495 Dealers, direct	\$2,183 Direct	\$4,199 Dealers	\$4,999 Dealers	\$3,495 Dealers	\$4,185 Dealers	\$3,014 Direct
16 MHz, 21MB 2 x 12 x 10 6.9 5.8 x 7.5 Sanyo Oak Phoenix 1.10 ■ / ■	20 MHz, 30MB 2 x 11 x 8.5 7 5.2 x 6.9 Compal/Tandon Intel Tandon 3.73 ■ / ■	20 MHz, 20MB 2 x 11.8 x 8.3 7.1 5.4 x 7.5 Chicony Intel AMI (4/90) ■ / ■	20 MHz, 20MB 1.8 x 11 x 8.5 5.9 6 x 8 TI TI Phoenix 1.00 ■ / ■	16 MHz, 20MB 1.9 x 12.2 x 10 6.9 5.1 x 6.8 Toshiba Toshiba Award 1.5 ■ / ■	16 MHz, 40MB 2 x 11 x 8.5 6.7 5 x 7 Twinhead Twinhead Phoenix V.1.10 20 ■ / ■	20 MHz, 30MB 1.4 x 11 x 8.6 4.6 5.3 x 6.9 Veridata Headland Award 3.10 ■ / ■	16 MHz, 20MB 2 x 12 x 10 7.1 5.8 x 7.5 Sanyo Oak Phoenix 1.10 ■ / ■
1MB-5MB None 21MB	1MB-16MB None 60MB	1MB-5MB None 30MB, 40MB, 60MB	2MB-6MB None 30MB, 40MB, 60MB	1MB-9MB None 40MB	2MB-4MB None 60MB, 80MB	1MB-4MB None 30MB, 60MB	1MB-5MB None 40MB, 60MB
1, 1, 0 □	2, 1, 0 ■	2, 1, 0 □	1, 1, 1 ■	1, 1, 1 ■	2, 1, 0 □	1, 1, 1 □	1, 1, 0 □
8 MHz None N/A N/A	8 MHz 1 modem ■ \$299	8 MHz 1 memory ■ N/A	8 MHz None N/A N/A	8 MHz 1 modem ■ N/A	8 MHz 1 memory □ N/A	8 MHz None N/A N/A	N/A 1 modem ■ N/A
Sanyo 16 Cirrus Logic □	Sharp 16 Cirrus Logic □	Sanyo 16 Cirrus Logic □	Sharp 32 WD □	Toshiba 16 Paradise □	Seiko-Epson 32 Cirrus Logic □	Sharp 32 Cirrus Logic □	Sanyo 16 Cirrus Logic □
82, 12, 4 None/none	81, 12, 4 Built-in/built-in	83, 10, 4 None/none	79, 10, 4 Built-in/none	86, 12, 8 None/none	80, 10, 4 Built-in/none	79, 10, 4 None/built-in	82, 12, 4 None/none
4.01 Oak EMM, utilities	4.01 Tandon EMM	4.01 None	4.01 Battery Watch, LapLink	4.01 None	4.01 Utilities	DR-DOS 5.0 None	4.01 Oak EMM, utilities
2,400-bps \$390	2,400-bps \$179	None N/A	2,400-bps with send-only fax \$499	2,400-bps \$349	None N/A	2,400-bps \$180	2,400-bps MNP 5 v.42 bis \$219
45, dual 2.5 2:22 8, 1 12V, 1.7Ah N/A ■ / ■ ■ / ■ 1.8 2 x 3 x 8	15, dual 3.5-4 1:51 N/A, 2 5.4V, 4.5Ah 8 hours ■ / ■ ■ / ■ 1.8 2.2 x 3 x 6.5	30, dual 2-4 1:41 4, 2 10.8V, 1.8Ah 4 hours ■ / ■ ■ / ■ 1.3 1.5 x 3 x 5.8	28, dual 3 1:46 15, 3 4.8V, 5Ah 7 hours ■ / ■ ■ / □ 1.4 2 x 5.8 x 3.3	30, dual 3 3:08 3, 1.5 14.4V, 2.2Ah 24 hours ■ / ■ ■ / ■ 1 1.8 x 5.8 x 3	40, dual 2.5 1:50 1.5, 1.5 4.8V, 5Ah 8 hours ■ / ■ □ / □ 1.5 1.8 x 3 x 6.5	30, dual 1.5 2:08 2, 1.5 10.8V, 1.2Ah N/A ■ / ■ ■ / ■ 0.9 1.7 x 2.9 x 5.8	45, dual 2.5 2:36 8, 1 12V, 1.7Ah N/A ■ / ■ ■ / ■ 1.9 2 x 3 x 8
■ / □ ■ / □ 1 year Dealer, vendor AEZ93744645	■ / □ ■ / ■ 1 year Vendor IIRBC380A	■ / □ ■ / □ 1 year Vendor E8HNB5620	■ / □ ■ / ■ 1 year Vendor A92S63T30	■ / □ ■ / □ 1 year On-site CJUK669	■ / □ ■ / ■ 1 year Dealer, vendor FKGSUPERNOTE-20	□ / □ ■ / □ 1 year Dealer HLOEL386S-20	■ / □ ■ / □ 1 year Vendor AEZ93744645

ENDS



Weighing under 8 pounds and capable of 3 hours of battery life, the Dell System 320N took second place on our Battery Rundown tests.

switch or use the built-in setup program to change the settings for automatic switching into standby after specified periods of unuse. A touch of the keyboard or mouse wakes the screen again, but the hard disk can remain sleeping until your application calls for disk access.

When you close the case, you automatically put the machine into sleep mode, and Dell claims that it can remain in that mode for 12 hours if the battery is fully

charged. You can set the interval for automatic video and hard disk time-out anywhere from 30 seconds to 30 minutes, and you can tell the machine to conserve power only when you use the battery, not the AC adapter.

A reserve power supply gives you 2 minutes' leeway to replace the internal battery without exiting an application. Unfortunately, you can't recharge the battery while using the computer, and recharging takes about 3 hours. An optional \$269 external recharger lets you recharge two batteries at once.

OPEN AND SHUT ADD-INS

All internal options, such as a math coprocessor, additional RAM, and the jumper that enables password protection are available under a sliding cover. You easily add RAM by plugging in proprietary 1MB (\$149) or 2MB (\$249) modules, up to a total of 5MB. Installing the data/fax modem is equally simple: You press down on a panel at the bottom of the machine, slide in the modem, and press the panel back into place. Two phone jacks are placed on the left side of the computer, near the back, where they're easy to reach but won't get in your way.

Dell's service policy is close to ideal. For one year you get next-day, on-site replacement of the whole machine through Xerox's service network. The technician will try to transfer data from the defective unit to the replacement. Everything about this computer, from its thoughtful design through its superb power management, inspires confidence—and Dell's on-site replacement policy inspires even more. Rival manufacturers may decide that this is the one to beat.

EPSON NB3s

by Greg Pastrick

The Epson NB3s may be one of the lightest and most conveniently expandable 386SX notebook computers around. Though adding on its many options is expensive, the expense is balanced by increased functionality and performance. \$4,297 buys a system that matches our 16-MHz standard configuration: 2MB RAM, 20MB hard disk. Epson goes other manufacturers one better by making the hard disk removable and the backlit LCD detachable. A 1.44MB floppy disk drive, DOS 4.01, and two 1-hour nickel cadmium batteries are also standard. Epson also sent along an expansion chassis that had two full-size slots and a removable 120MB hard disk, which would make the NB3s truly desktop ready, if not pricey, at \$6,296.

The NB3s is slim (1.8 by 11.5 by 8.3 inches), and its removable components are small and light as well. The 2.5-inch Conner/Seiko-Epson hard disks are

PC FACT FILE EDITORS' CHOICE

Dell System 320N

Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-426-5150.
List Price: \$4,082.

Tested Configuration: 3MB RAM, 60MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01, carrying case.
Options: 40MB unit, \$3,782. 1MB RAM upgrade, \$149; 2MB RAM upgrade, \$249; 4MB RAM upgrade, \$498; 80387SX/20, \$349. External floppy disk drive, \$349; 2,400-bps modem with send/receive fax, \$399; extra battery, \$79.95; AC power adapter, \$69.95; car battery adapter, \$129; network adapter, \$429; external CRT adapter, \$249; numeric keypad, \$149.

CIRCLE 428 ON READER SERVICE CARD

PC FACT FILE

Epson NB3s

Epson America Inc., 20770 Madrona Ave., Torrance, CA 90503; 800-289-3776.
List Price: \$4,297.

Tested Configuration: 2MB RAM, 20MB removable Conner/Seiko-Epson hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01.

Options: 1MB RAM upgrade, \$299; 4MB RAM upgrade, \$1,199; upgrade to 40MB hard disk, \$1,150; upgrade to 60MB hard disk, \$1,550. 120MB removable hard disk, \$1,299. 2,400-bps modem with MNP 5 data compression, \$399. Battery charger, \$299; car battery adapter, \$149; numeric keypad, \$149; expansion chassis, \$699; standard carrying case, \$99.

CIRCLE 429 ON READER SERVICE CARD

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Users will
automatically
like it.



You should like it; after all, your suggestions helped design it. But we didn't stop there. After we made improvements you asked for, like a new windows-style interface, we added plenty of others.

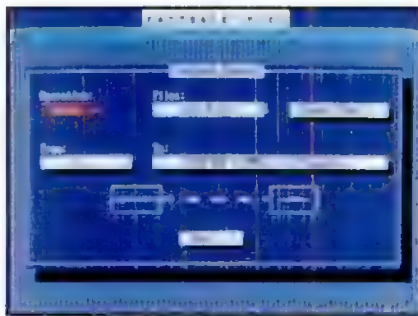
- An archiving feature that erases unwanted files after backup
- Faster backups and restores: up to 10 mb/minute on some PCs (up to 3mb/minute on an average AT)
- Increased data compression to a full 80 percent, 15% more than version 2.1
- Appending incremental backups
- dBase III-compatible history file database lets you search for and restore specific files
- Backup support for "Bindery and Trustee" files on Novell Network 286/386

And like all Fifth Generation products, Fastback Plus 3.0 is automatically covered by a one-year, money-back guarantee. Upgrade now for only \$49 and get FREE overnight delivery*. Just mail or fax the attached reply card with your payment to the address or fax number below. Or call us toll-free. This offer is limited to Fastback or Fastback Plus users with a valid program serial number.

The rest of you
will like it because
it's automatic.

If you're not backing up regularly, you either don't have the right backup program, or you don't have one at all. Fastback Plus 3.0 solves both problems with an entire program full of time and effort-saving features that make backing up so automatic, you can literally do it in your sleep.

- Scheduler and macro recorder for fully-automated, unattended backups



The new fast, simple Express Menu.

- Macro editor in plain English instead of DOS commands
- Optional password protection with DES file encryption capability
- New easy-to-use, windows-style interface with Express Menu
- Advanced error correction for recovering data from damaged disks

And these are just a few of Fastback Plus 3.0's new features. Now more than ever, there's really no excuse not to back up your data. Because if you don't want to do it, this program will do it for you. Automatically. For more about Fastback Plus 3.0, call the toll-free number below.



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CIRCLE 286 ON READER SERVICE CARD

pocket-sized, and the battery weighs in at 0.7 pounds. True, each battery gives you only an hour of computing time, but Epson supplies two packs as standard equipment.

The NB3s's proprietary memory card plugs into a covered hatch above the keyboard and holds a maximum of 5MB of DRAM. Pull the card out by tugging on a plastic handle, and you see a socket for an optional math coprocessor. The power switch, manual sleep-mode button, and a small system status LCD window are built into the case above the keyboard, too.

Although the NB3s's VGA LCD display is not as crisp and clear as that of its sidelit siblings, you can detach it, making the use of a standard CRT monitor a good deal less cumbersome.

The keyboard has the inverted-T cursor-key layout but does not have dedicated PgUp, PgDn, Home, and End keys.

The NB3s has three hard disk options. The 20MB removable drive is rated for 23-millisecond access times; the 40MB and 60MB versions, for 19 ms. The removable 120MB Conner/Seiko-Epson hard disk fits into the expansion chassis only; it weighs 1.58 pounds and measures 1.25 by 6.25 by 4.25 inches. Other options include a car battery adapter for \$129 and a numeric keypad for \$149.

The trade-offs in battery life, weak display, and lack of bundled software are more than matched by the Epson NB3s's low weight, power, and versatile design.

The NB3s's power-saving features are enabled in two ways: through CMOS setup and the manual system sleep-mode button. You can set display and disk time-outs in 1-minute increments. The display time-out setting monitors keyboard inactivity and sets the CPU to 8-MHz operation. The manual sleep-mode button powers down the CPU to 4 MHz so that you can close the lid, walk away, then

resume where you left off by pressing the button again. You'll need to keep both packs fully charged if you expect to be running the system on unassisted power longer than an hour.

The NB3s performance on our tests show excellent 386 processing and better-than-average times on the file access, conventional memory, and screen routines.

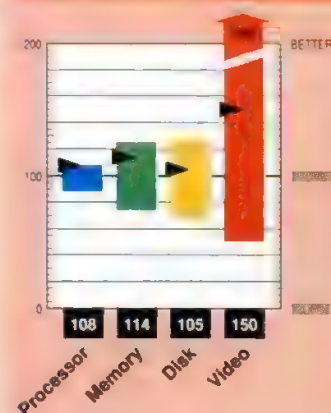
Epson's standard warranty package includes 1-year coverage on parts and labor and a \$2 per minute technical support line (900-988-4949) available Monday through Friday, 7 to 4 P.S.T. National service is handled by Epson Customer Care Centers. Extended-warranty Extra Care service is \$29.95 annually (\$129.95 for a system with an expansion chassis and 120MB hard disk).

The trade-offs in battery life, weak display, and lack of bundled software are more than matched by the NB3s's low weight, power, and versatile design. The portability and security of the removable hard disks alone make this system worth looking at.

Epson NB3s

BATTERY RUNDOWN TEST SCORE:
1 HOUR 2 MINUTES

▶ TEST RESULTS



In Short: Strong on options and expandability, the 16-MHz Epson NB3s is a 6-pounder, right for the road and desktop. Pocket-size removable hard disks, easy memory upgrades, excellent performance, a detachable (though dimmer-than-average) display, and a docking station offset the disadvantage of short battery life. Epson supplies a spare battery, and you'll need to carry it. Still, this notebook is worth a look.



With good performance and great expandability, the 6-pound Epson NB3s is ready for the road.

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IBM PS/2 L40 SX

by Mitt Jones

IBM stolidly declines to refer to its \$5,995 Personal System/2 L40 SX as a notebook laptop. It's not that this 7.7-pound machine—IBM's first new laptop since the 1986 introduction of the infamous PC Convertible—measures much larger than some of its notebook competitors; IBM simply intends this 20-MHz clamshell as more of a desktop replacement machine and is reportedly saving the notebook moniker for smaller IBM laptops to come.

In keeping with its somewhat-more-than-a-notebook mission, the L40 comes with an impressive collection of standard features, including a 60MB Conner Peripherals hard disk and an external numeric keypad. The standard 2MB of memory can be upgraded through dealers to a total of up to 18MB. Other options include a 2,400/9,600-bps data/fax modem that was included with the early production unit IBM sent for our evaluation; it brought the price up to \$6,654.

WIDE OPEN SPACES

Aside from the IBM label, the primary attraction of this machine for many buy-

ers will undoubtedly be its spacious keyboard layout. An IBM spokesperson reports that the company designed the chassis, which measures 2.1 by 12.8 by 10.6 inches, to accommodate the abridged 101-style keyboard design. Lop the numeric keypad off the right side of the unabridged version of the 101 keyboard and condense its other ancillary keys somewhat, and you've got IBM's keyboard design about right. Apart from these changes, the most notable compromise involves the six keys that normally line up above the inverted-T cursor pad in two rows; they now descend in two columns. The key action—clicky and somewhat loose—will undoubtedly draw disparate responses from different users, but overall the effect



The IBM PS/2 L40 SX has an amazing keyboard but is a bit too large to be a true notebook.

CONVERTIBLE
386SX NOTEBOOKS

The IBM PS/2 L40 SX
comes equipped with
temperature and dew
point sensors.

is quite good, thanks in part to the 5-degree incline that IBM built into the keyboard.

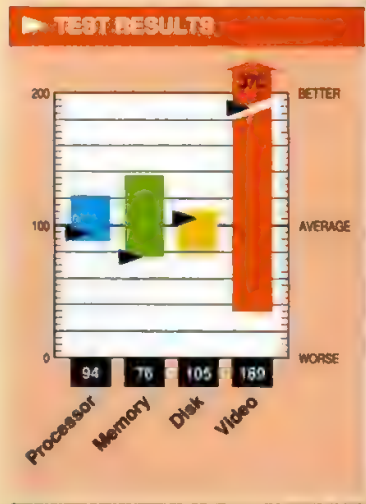
WEATHERMAN ON-BOARD

In another notable departure from its competition, the L40 comes equipped with temperature and dew point sensors. If the temperature or humidity exceeds the machine's operating range (41 to 95 degrees Fahrenheit and 5 to 95 percent humidity), the appropriate LCD indicator will activate, warning you to turn off the machine.

The substantial drawbacks of this machine begin with its sidelit, supertwist LCD display. The display—8 inches wide and 6 inches high—generates as many as 32 shades of gray, but it suffers badly from ghosting and an unevenness of background in its default black-on-white mode. The background is much smoother when the display is set to white on black, but ghosting is still a significant distraction. To make matters worse, IBM provides no means to invert the display from within an application, forcing you instead to run a

IBM PS/2 L40 SX

BATTERY RUNDOWN TEST SCORE:
1 HOUR 52 MINUTES



In Short: The 7.8-pound 20-MHz IBM PS/2 Model L40 SX features an excellent and spacious keyboard layout and a healthy collection of standard features, including a 60MB hard disk and external numeric keypad. Drawbacks include its 2.1-by-12.8-by-10.6-inch chassis, a VGA display prone to severe ghosting, and a battery life considerably shorter than the company's 3-hour rating.

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WeCycle Waste Corporation The Materials Research Group Recommendation: FOCUS: ALUMINUM

... research Group provides the
... continue to

This study
basis for
expand
next 6
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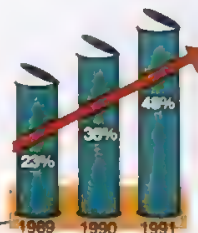


WeCycle Waste Corporation

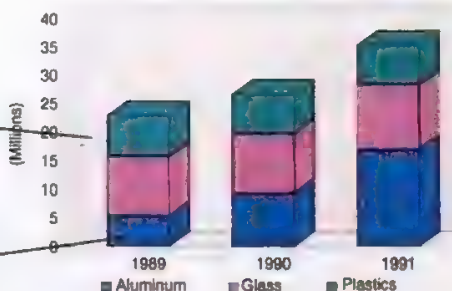
The Materials Research Group Recommendation:

FOCUS Aluminum

This study conducted by the Materials Research Group provides the basis for our most recent recommendation that WeCycle continue to expand its aluminum recycling capacity by another 70% over the next 6 years. The graph to the right shows the increasing proportion of our business provided by the aluminum division during the past three years, now approximately half of all revenues. It is our opinion that, at this rate of growth, aluminum recycling will continue to offer our company its greatest opportunity for expansion over the next decade, and certainly into the 21st century.



Gross Revenues by Product



Glass and Plastics

As can be inferred from the graph to the left, glass and plastics recycling has been holding steady throughout this same period, and has consequently become a smaller proportion of our overall sources of revenue.

Although this group would strongly recommend that WeCycle Waste Corporation do all that is necessary to increase its activities in these areas, our studies have shown that aluminum will become increasingly the material of choice in the shipping, heavy manufacturing and container industries.

Aluminum

It is our opinion that sources of aluminum products will be pressed close to their limits over the next decade.

Therefore, we propose that WeCycle Waste Corporation invest in more aluminum capacity during the next five years in order to take the best advantage of this increasing market demand.

WECYCLE PRODUCT	1989	1990	1991
Aluminum			
East	2,323,426	4,019,527	7,315,539
Central	1,372,347	2,374,160	4,320,972
West	1,728,492	2,986,831	5,436,033
Total	5,424,265	9,380,518	17,072,544
Glass			
East	2,496,721	2,567,821	2,798,925
Central	3,598,757	3,217,693	3,507,285
West	4,217,635	4,471,294	4,873,710
Total	10,313,113	10,256,808	11,179,920
Plastics			
East	2,897,493	3,171,243	3,234,668
Central	1,873,938	1,823,697	1,880,171
West	2,378,942	1,967,421	2,006,769
Total	7,150,373	6,962,361	7,101,608

Make your spreadsheet sing your hardware.

There's a lot to like about the new Lotus® 1-2-3® for DOS Release 2.3.

For starters, it's not just a graphical spreadsheet. It's a fast, graphical spreadsheet for DOS. It's easy to use. And it works as well on an older XT with just 512K of memory as it does on the newest 486 machine.

It also shares many features in common with our powerful 3D spreadsheet 1-2-3, Release 3.1. Including its superb spreadsheet formatting and publishing capabilities and full mouse support. Along with its popular Auto Compress feature that gives you a trouble-free way of making larger worksheets print on a single page.

We've also added new features you won't find in other spreadsheets. Like



With its WYSIWYG graphical environment, you can do all your formatting "live" on screen.

the Viewer (based on Lotus Magellan® technology) which lets you view files before retrieving them and makes file linking as easy as point and click. And a very helpful Auditor that simplifies the job of documenting and analyzing worksheet logic.

Of course, you won't just like what Release 2.3 does. You'll like how it feels. It's quick and smooth. With a WYSIWYG (what-you-see-is-what-you-get) graphical environment that lets you format text, data, and graphics "live" on screen. With the mouse, you can execute commands, highlight cells or ranges, open dialog boxes, place and size graphs, change type styles, fonts and point sizes. All with unparalleled speed and ease.

What's more, Release 2.3 gives you a wide range of printing and reporting capabilities. Including the capacity to place as many live graphs on a worksheet as you'd like.

Along with 96 type style combinations, drop shadows, new 3D-effect graphs, drawing and annotation tools, and the most font support, choices of colors and shading available.

Compatibility? As with any 1-2-3 product, it's no problem. Because Release 2.3 will read all of the files you've created on previous versions of 1-2-3, including files you've formatted using Allways™ and Impress.™ So you'll preserve all your work, as well as your training.

For more information see your Lotus Authorized Reseller. For a free demo or to order your upgrade directly from Lotus* call 1-800-TRADE-UP, ext. 6010.



Lotus 1-2-3 Release 2.3 runs smoothly and quickly no matter what hardware you're running it on.



What's New In Lotus 1-2-3 Release 2.3.

- A WYSIWYG graphical environment with live on-screen formatting
- Lotus Magellan viewer technology for fast file previewing, retrieving and linking...all without leaving your active worksheet.
- More graph types, including 3D-effect graphs and graph annotation capabilities.
- Auto Compress, for a trouble-free way of making larger worksheets print on single page
- Dialog Boxes for an easier, more interactive way of working
- Text-editing for easy on-sheet word processing, including automatic word wrap, even around graphs
- The Auditor for documenting or highlighting your spreadsheet logic
- Improved memory management for building larger worksheets up to 12 MB in size
- New printer drivers that support all leading laser and dot-matrix printers
- Context-sensitive, interactive Help and an on-line tutorial

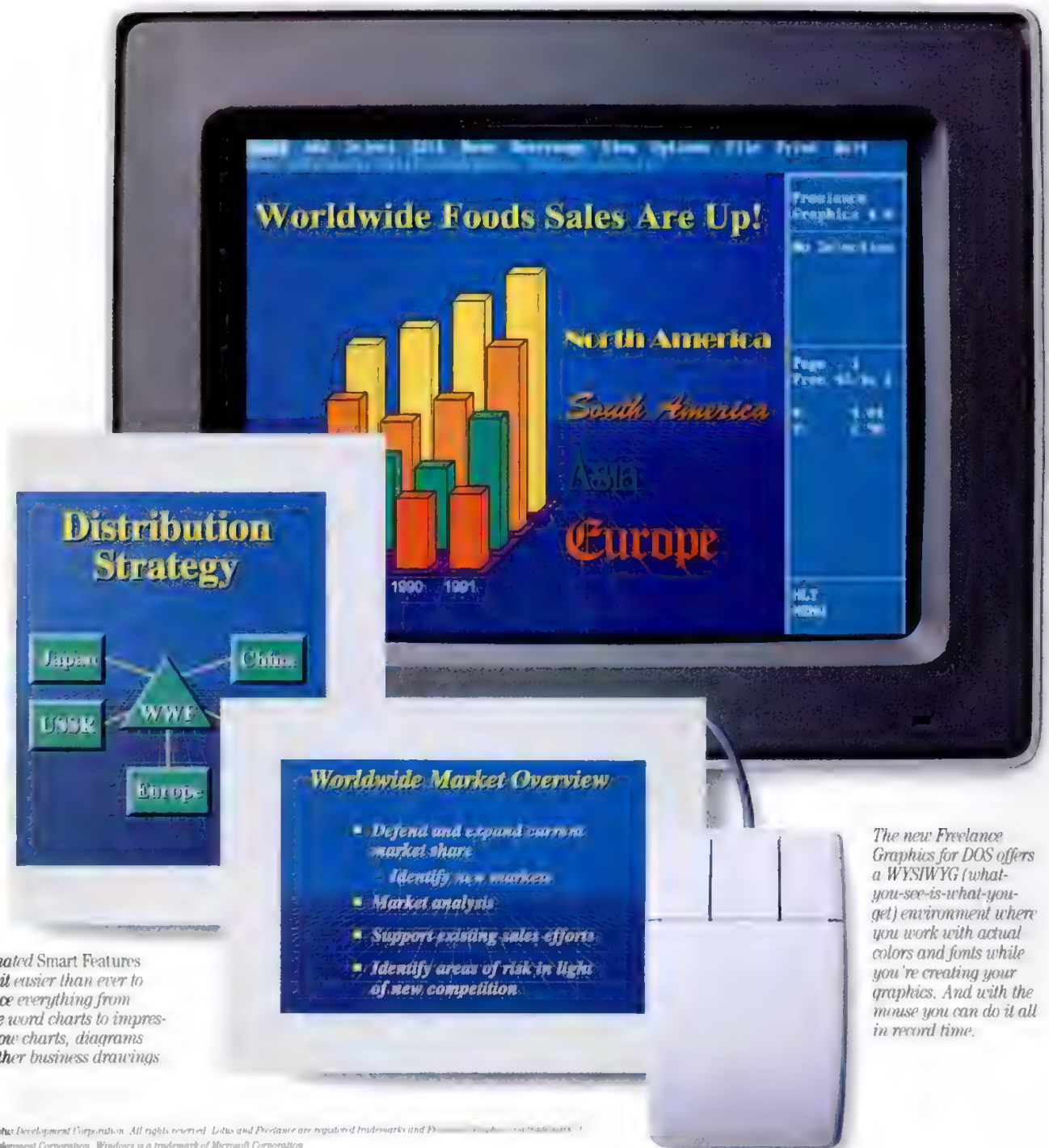
*Please have your credit card and product package ready when you call. In Canada, call 1-800-668-1509.

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The new Lotus 1-2-3 for DOS



Introducing the new It will create your next Not to mention



Automated Smart Features make it easier than ever to produce everything from simple word charts to impressive flow charts, diagrams and other business drawings

The new Freelance Graphics for DOS offers a WYSIWYG (what-you-see-is-what-you-get) environment where you work with actual colors and fonts while you're creating your graphics. And with the mouse you can do it all in record time.

Freelance Graphics. presentation beautifully. automatically.

Now there's an even better version of Freelance® Plus, the award-winning graphics program praised by *PC Magazine*, *PC World* and *Software Digest*. It's so improved, in fact, we even changed its name. Introducing Freelance Graphics™ 4.0. The best presentation graphics program for DOS.

For starters, we've added a graphical WYSIWYG environment. Which means you'll work with actual colors and fonts while creating your graphics. Plus, you'll know what your output



For two consecutive years, Software Digest awarded Freelance Plus its highest-rating. Now with Freelance Graphics, we've made the best even better.



Only Freelance Graphics, with its unique automated Smart Features can turn your rough ideas into a smooth presentation this easily.

will look like before you print.

And with the mouse you'll do it all—from executing menu commands to moving a chart—in record time.

Yet what's really unique about the new Freelance Graphics is its **Smart Features**. Unlike other DOS graphics programs, its hard-working **Smart Features** automate

the process of turning your ideas into persuasive presentations. So while you're concentrating on what you want to say, Freelance Graphics will take care of how it looks. Whether you're creating slides, overheads, or hard copy, in color or black-and-white.

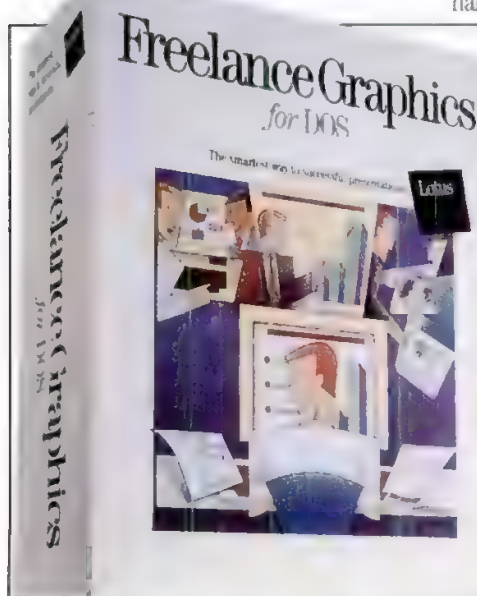
Here are a few of its **Smart Features**:

Portfolio, a built-in presentation manager, helps you organize and prepare your presentation; a **Text Chart Outliner**, complete with a spell-checker, creates stacks of text charts in seconds; **Auto-charting** makes weekly or monthly reporting a snap by printing hundreds of up-to-date charts with a single command; **Smart Chart Update** automatically recomposes a chart whenever the data changes... even if you've added annotations or symbols; and over 1,000 **Pre-drawn Symbols and Design Backgrounds**.

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*Developed by Symantec Corporation, especially for Freelance Graphics. Offer expires September 30, 1991, after which the Lotus direct upgrade price will be \$119. †Eligible products for upgrade offer include all versions of the following products: Lotus Freelance Plus or Graphwriter, Harvard Graphics, DrawPerfect, Applause II/Draw Applause, Graph Plus, Charisma, Microsoft Chart, Parv, Gem Series, ChartMaster, Diagram Master. ‡Freelance Graphics 1.0 upgrade also available at participating Lotus resellers.

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our products are easier to learn and use than other products in their categories. It's that simple.

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batch command from DOS or use the disk-based setup utility.

Those who buy the machine expecting a battery life anywhere close to IBM's 3-hour rating will find another reason to complain: At full power, the L40 lasted for only 1 hour and 52 minutes on PC Magazine Labs' rundown test. Of course, the L40's battery conservation features—automatic display, hard disk, system slow-down, and system suspend/resume utilities—will stretch battery life a good deal, but the best way to get 3 hours out of this machine will be to tote an additional, 1.2-pound, \$129 battery. The \$219 quick charger should also be a hot seller: The standard A/C adapter requires 10 hours to charge the battery pack, whether or not the machine is on.

Another complaint concerns the L40SX's resume feature, a now-common capability that IBM pioneered with the PC Convertible. The L40 maintains memory contents in standby mode for as long as five to six days on a full charge and 6 hours when depending on its internal, secondary battery alone, but our evaluation unit consistently required a frustrating 25 seconds to come out of standby mode.

The IBM PS/2 L40 SX fares somewhat poorly overall when compared with the best of its competition, thanks primarily to its lackluster VGA display and relatively short battery life. When judged as a desktop replacement system, it also falls a bit short, primarily because of its lack of expansion chassis and external keyboard connector. Even so, the keyboard of this machine rates as a significant and legitimate advantage over other notebook portables—one that may make taking a closer look at the L40 well worth your while.



FACT FILE

IBM PS/2 L40 SX

IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; 914-642-4662.

List Price: \$6,654.

Tested Configuration: 2MB RAM, 60MB Conner hard disk, 1.44MB floppy disk, VGA LCD, 2,400/9,600-bps data/fax modem, DOS 4.01.

Options: 2MB RAM upgrade, \$899; 4MB RAM upgrade, \$1,995; 8MB memory module, \$3,595. Extra battery, \$129; car battery adapter, \$249; quick charger, \$219; track point device, \$159; deluxe carrying case, \$199; travel case, \$369.

CIRCLE 843 ON READER SERVICE CARD

LEADING TECHNOLOGY PC Partner XL

by Kellyn Betts

Portables have generally been exempt from the design blahs that plague many PCs. But Leading Technology's PC Partner XL has taken this already impressive design level to a higher plane: This 20-MHz notebook looks so chic that its out-classed rivals seem merely pretty in comparison. Unfortunately, in this case, beauty is indeed skin-deep.

For \$2,495, you get a 6.75-pound machine with our standard configuration of 2MB of RAM, a 20MB hard disk, one parallel and one serial port. A rather cheap mouse and external 2,400-bps modem are also included at no extra cost, but the size and weight of a standard external modem make it less attractive for users who must communicate while they travel. You're better off investing in a portable, battery-powered modem, like TouchBase Systems' WorldPort 2400.

The PC Partner XL is otherwise suitable for traveling. Its battery held out for somewhat less than 2 hours on our run-



FACT FILE

PC Partner XL

Leading Technology Inc., 10430 S.W. Fifth St., Beaverton, OR 97005-3447; 503-646-3424; fax: 503-626-7845.

List Price: \$2,495.

Tested Configuration: 2MB RAM, 20MB PrairieTek hard disk, 1.44MB floppy disk drive, expansion chassis, VGA LCD, 2,400-bps modem, AC power adapter, DOS 4.01, HyperDOS 2.0, carrying case.

Options: 1MB RAM upgrade, \$119; 2MB RAM upgrade, \$239; 4MB RAM upgrade, \$449; upgrade to 40MB hard disk, \$599; extra battery, \$79.50; car battery adapter, \$89; leather carrying case, \$199.

CIRCLE 844 ON READER SERVICE CARD

down tests, but its power-saving features—automatic processor slowdown, CMOS-controlled screen shut-off and disk power-down—can increase that time.

The 1.8-pound AC converter brings the total carry weight to more than 10 pounds. This would probably seem like less of an issue if the external modem could be crammed inside the faux leather carrying case that Leading Technology provides.

The PC Partner XL's keyboard has a greater key-travel distance than some of its competitors and offers only four cur-



Lack of space for an internal modem on Leading Technology's PC Partner XL may make buyers beware.

THE FINE ART OF DISC DRIVES



Oil Painting by
Loran Speck
Carmel, California

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 **Seagate**



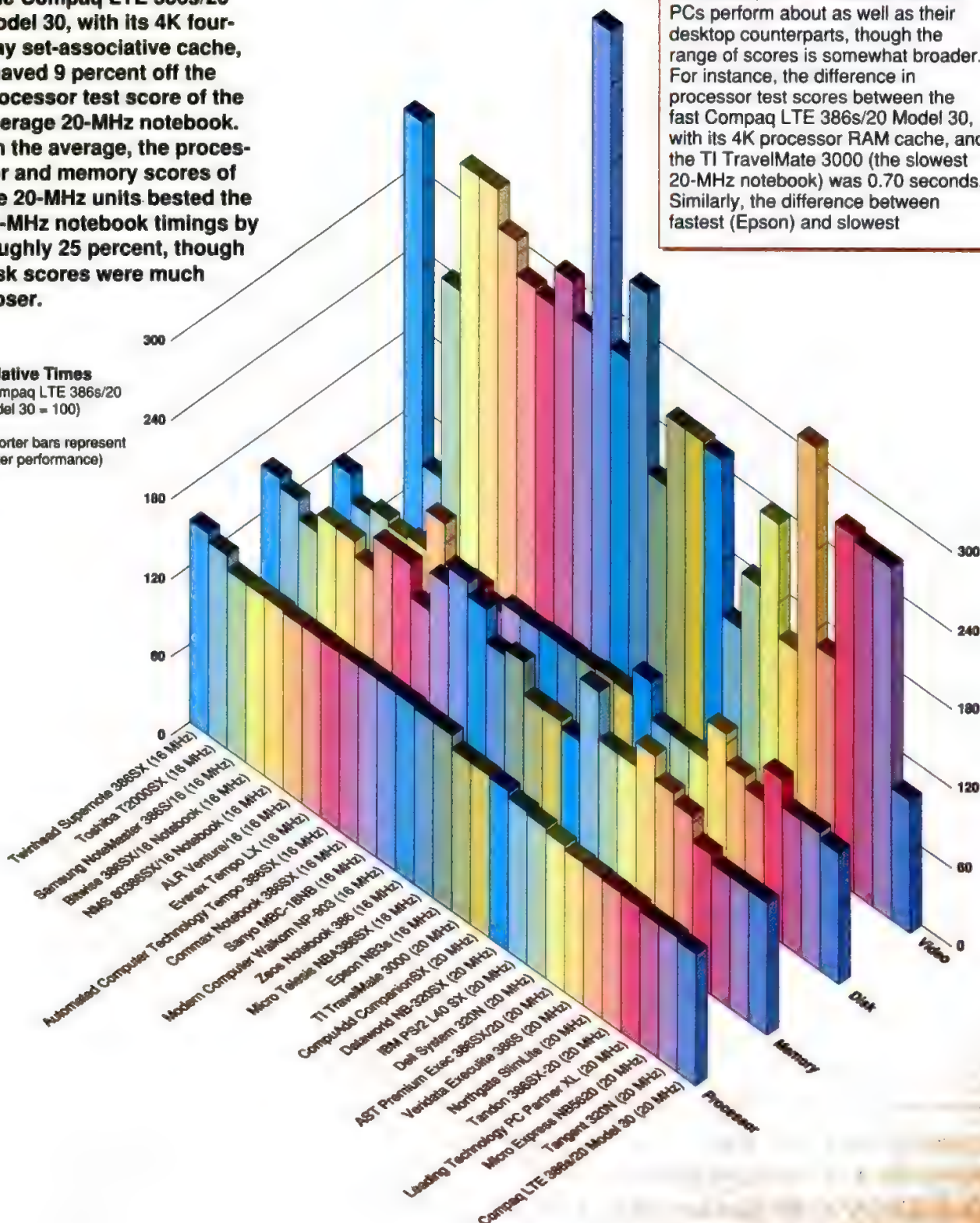
BENCHMARK TESTS: 386SX NOTEBOOKS

The Compaq LTE 386s/20 Model 30, with its 4K four-way set-associative cache, shaved 9 percent off the processor test score of the average 20-MHz notebook. On the average, the processor and memory scores of the 20-MHz units bested the 16-MHz notebook timings by roughly 25 percent, though disk scores were much closer.

WHAT THE NUMBERS MEAN

As a class, the 27 notebook 386SX PCs perform about as well as their desktop counterparts, though the range of scores is somewhat broader. For instance, the difference in processor test scores between the fast Compaq LTE 386s/20 Model 30, with its 4K processor RAM cache, and the TI TravelMate 3000 (the slowest 20-MHz notebook) was 0.70 seconds. Similarly, the difference between fastest (Epson) and slowest

Relative Times
(Compaq LTE 386s/20 Model 30 = 100)
(Shorter bars represent better performance)



(Twinhead) 16-MHz notebook was 0.66 seconds.

Conner hard disks dominated the field in this batch of notebooks, where only two other vendors were found, JVC and PrairieTek. The PrairieTek hard disks found in the Dataworld NB-320SX and Leading Technology PC Partner XL performed poorly on sequential disk reads.

16-bit versus 8-bit video made the difference between above- and below-

average video test performers. Slower scores came from vendors who supply 8-bit video: Modern Computer Corp., Twinhead, the three systems manufactured by Nan Tan (Micro Telesis, Bitwise, and National Micro Systems), and Leading Technology (the only 20-MHz system with 8-bit video). Only one 16-bit 20-MHz system—the Northgate SlimLite—turned in a poorer video score than the Leading Technology unit.

HIGHLIGHTS

1 Compaq: Processor, Video

Compaq's 4K four-way set-associative processor RAM cache contributed greatly to its Number One processor finish. This model turned in a superior video score as well.

2 Twinhead: Processor

The Twinhead notebook placed last on the processor test. Eight-bit video contributed to the poor video score, and a 29-ms. hard disk gave this system a poor disk score.

3 Modern Computer: Memory, Video

The Modern Computer Walkom NP-903's 8-bit video circuitry turned in the worst video score. Slow 80-nanosecond ZIPs did nothing to help this system on the memory benchmark test.

4 ALR, Veridata: Disk

Both of these systems were tested with DR-DOS. Because of the overhead imposed by this operating system's handling of files, these notebooks turned in slow disk test scores.

5 Toshiba: Video

Toshiba's Paradise video chip set propelled the T2000SX to first place on our video test.

(Lower scores represent better performance)

	Processor (seconds)	Memory (seconds)	Disk (seconds)	Video (seconds)
Twinhead Supernote 386SX (16 MHz)	4.76	0.89	83.44	5.38
Toshiba T2000SX (16 MHz)	4.56	0.66	68.82	1.38
Samsung NoteMaster 386S/16 (16 MHz)	4.24	0.60	73.27	3.73
Bitwise 386SX/16 Notebook (16 MHz)	4.23	0.66	70.48	5.22
NMS 80386SX/16 Notebook (16 MHz)	4.23	0.66	72.41	5.22
ALR Venture/16 (16 MHz)	4.18	0.61	92.74	4.78
Everex Tempo LX (16 MHz)	4.18	0.72	72.43	4.39
Automated Computer Technology Tempo 386SX (16 MHz)	4.17	0.72	73.23	4.34
Commax Notebook 386SX (16 MHz)	4.17	0.61	67.98	4.78
Sanyo MBC-18NB (16 MHz)	4.17	0.74	73.24	4.34
Modern Computer Walkom NP-903 (16 MHz)	4.17	0.80	72.73	8.02
Zeos Notebook 386 (16 MHz)	4.16	0.75	73.33	4.33
Micro Telesis NBA386SX (16 MHz)	4.11	0.64	73.14	5.27
Epson NB3s (16 MHz)	4.10	0.66	72.58	3.18
TI TravelMate 3000 (20 MHz)	3.79	0.55	73.53	4.01
CompuAdd CompanionSX (20 MHz)	3.78	0.55	73.14	4.01
Dataworld NB-320SX (20 MHz)	3.75	0.53	87.02	3.96
IBM PS/2 L40 SX (20 MHz)	3.59	0.74	67.59	2.15
Dell System 320N (20 MHz)	3.53	0.58	67.11	2.81
AST Premium Exec 386SX/20 (20 MHz)	3.44	0.58	67.05	3.68
Veridata Execulite 386S (20 MHz)	3.34	0.66	68.04	2.36
Northgate SlimLite (20 MHz)	3.30	0.58	72.55	4.89
Tandon 386SX-20 (20 MHz)	3.27	0.55	67.02	2.58
Leading Technology PC Partner XL (20 MHz)	3.25	0.47	85.43	4.18
Micro Express NB5620 (20 MHz)	3.16	0.44	71.63	4.12
Tangent 320N (20 MHz)	3.16	0.44	72.21	4.12
Compaq LTE 386s/20 Model 30 (20 MHz)	3.09	0.44	68.85	1.54

■ The Instruction Mix benchmark test times a series of tasks specific to the processor. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

■ The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at relatively slow access speeds.

■ The disk score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

The Direct to Screen benchmark test indicates the speed of the video adapter memory. A good score indicates that information can get to the screen quickly, particularly when programs bypass the computer's video BIOS.

HOW WE TESTED

In testing these 27 386SX 16- and 20-MHz notebook systems, we used PC Magazine Labs' Hardware Performance Tests, Release 5.6, with video and system shadowing enabled wherever possible, and we left the buffers at their default values. All but the ALR Venture/16 and the Veridata Execulite 386S were tested with DOS 4.01 or 3.3. ALR and Veridata ship their systems with DR-DOS only (ALR supplies it on-disk and Veridata in ROM). For this review, we used no software disk caches when performing disk benchmark tests, and no RAM-resident programs were loaded for any tests. The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds.

sor-control keys in the nonstandard L-shaped layout.

Though this Leading Technology laptop's backlit supertwist LCD illuminates applications with aplomb, it suffers from the echo and persistence problems indigestible to the species.

If you need more than 40MB of storage space, you can buy a \$649 expansion unit to plug in additional cards and drives. That price doesn't include the cost of the extra components, though the unit's two 16-bit card slots might make it worth the steep price. Still, any peripherals you put

on this unit would have to traverse the PC Partner XL's slow 6.67-MHz bus, which caused its 20MB PrairieTek hard disk to perform relatively poorly on our tests.

PRETTY IN PLASTIC

If you don't find these flaws fatal, you're certain to be enticed by the PC Partner XL's superior design. From the standpoint of sheer aesthetics, the notebook is a pleasure to gaze upon. From a more practical perspective, the floppy disk

drive's right-side location and the AC converter's left-side plug placement are ideal. The machines' dual sliding hinges also hold the LCD in place far more firmly than some of its competitors' front-positioned latches do.

The machine's LCD screen, disk drives, battery, and power supply are covered for only six months—half the warranty length offered by competitors. And while this machine has undeniable visual appeal, you really have to be bowled over by its good looks to be willing to ignore its other shortcomings.



PERFORMANCE TESTS: 386SX NOTEBOOKS

Nickel hydride gives the Toshiba T2000SX the top battery rundown score, though Dell breaks the 3-hour barrier with a single nickel cadmium battery pack. The 20-MHz systems, as a group, tend to have nearly 10 percent shorter battery life than the 386SX/16s, though the Dell, AST, and Compaq outlast many 16-MHz units.

HIGHLIGHTS

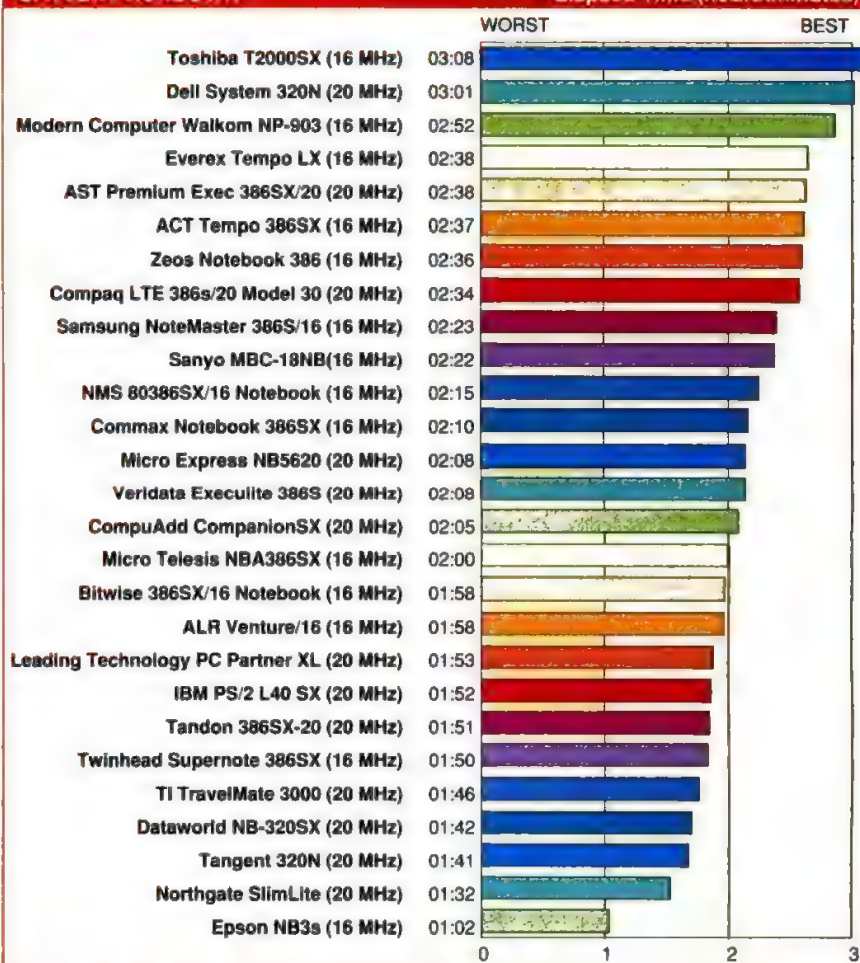
The only notebook of the 27 in this review to use nickel hydride technology, the Toshiba T2000SX held out the longest—3 hours 8 minutes—on our Battery Rundown test. Its 2.2-Ah battery even outlived Toshiba's claim, albeit by a scant 8 minutes. Just as impressive, however, was the Dell System 320N's standard nickel cadmium battery—the only other battery to break the 3-hour mark.

The Modern Computer Walkom NP-903 also lasted for nearly 3 hours, though it was tested with two 1-pound modules; the manufacturer claims a life of 5 hours in that configuration. The Walkom was one of four machines (with the trio from Bitwise, Micro Telesis, and National Micro Systems) that could accommodate two batteries and were tested with two.

The Epson NB3s and the Northgate SlimLite had the shortest battery lives. Though the Epson lasted only 1 hour 2 minutes, the vendor includes a second, 0.6-pound battery with the system. Only one can be installed at a time. The Northgate's low time of 1 hour 32 minutes was verified when we tested another battery from the company, which produced similar results. Northgate said that it has since modified its charger to boost battery life.

BATTERY RUNDOWN

Elapsed Time (hours:minutes)

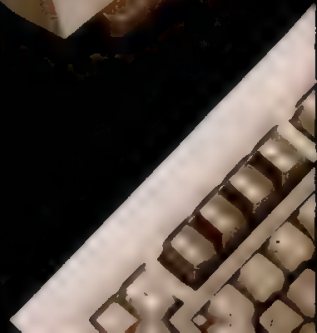


All 27 notebooks were tested at their maximum power-consumption and CPU-speed level, using PC Magazine Labs' Hardware Performance Tests, Release 5.6. All power conservation features were disabled. I/O ports and modems, where applicable, were turned on, and screens were set at maximum brightness. The tests access the hard disk constantly.

The **Battery Rundown** performance test involves teletyping five screens of text to the laptop computer's display and writing a 15K file to the hard disk, once every minute until the battery runs out of power.



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Government Computer News, "Arguably the fastest MS-DOS and OS/2 micro in the world."

PC Resource, "ZEOS ... provides quality comparable with IBM or Compaq and does so for about 70% of the price."

PC Magazine, Editor's Choice, "The ZEOS blows away every other computer... a smart choice."

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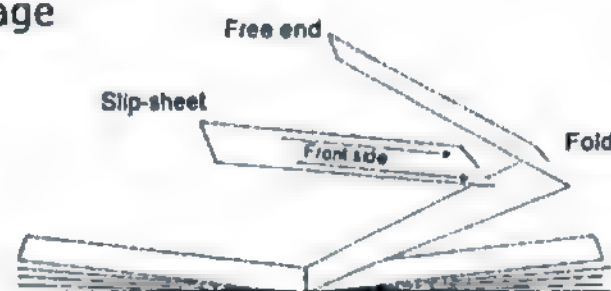
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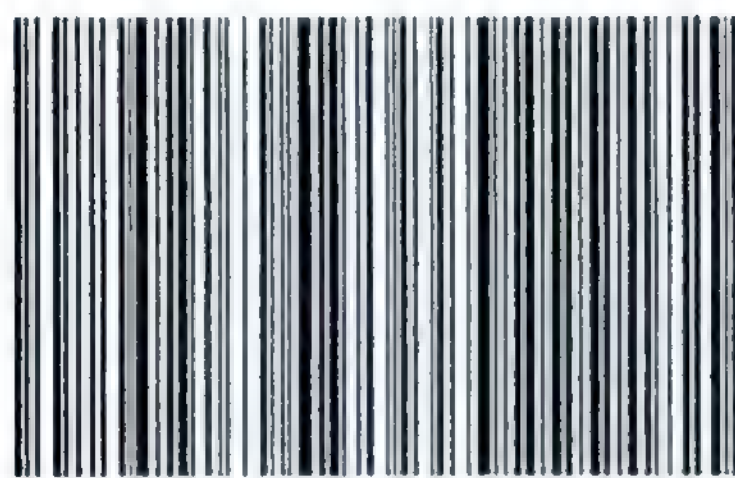
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Foldout slip-sheet



GbsSlipSheet-001

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Folded edge of the page

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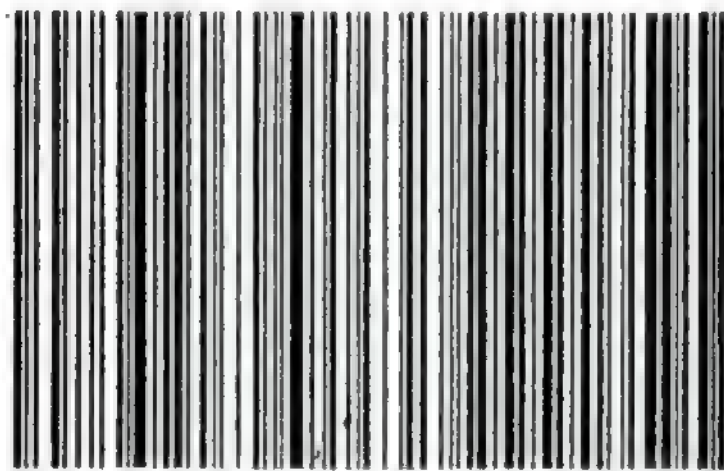
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Take it from the experts. ZEOS builds the best '386 systems! "Quality comparable with IBM or Compaq... Excellent Value... Blows away every other computer... ZEOS is top drawer... Unbeatable... Top Honors... A smart choice!"

The industry experts love ZEOS systems.

And you will too. Why?

Because ZEOS really does build the very best

'386 systems you can buy. In naming the ZEOS '386-33 *Editor's Choice*, *PC Magazine* said ZEOS shows "that you needn't be among the most expensive to be the best." But what does that mean to you?

It means that when you purchase your new ZEOS '386 you will receive more Performance, superior Quality, and better Support than you can get anywhere else. Take performance for instance.

CACHE MEMORY MEANS PERFORMANCE!

That's why each and every ZEOS '386DX system has a minimum of 64K SRAM Cache standard; *our 33MHz screamers come standard with a 128K*

Cache. Having an on-board memory cache is important in realizing the full potential of any '386 processor. That's why only low end '386DX systems are sold without a Cache. That's why ZEOS gives you a Cache, and all the extra performance that comes with it!

And it's not only the Cache that's fast, so is everything else. In choosing the ZEOS '386-33 as *Editor's Choice*, *PC Magazine* noted "ZEOS International designed this machine for speed—and came up with a system that topped four of our benchmark tests and excelled on the remaining ones." Designed for speed. Absolutely.

Speaking of speed. Standard in your new ZEOS '386 will be one of our *incredibly fast* 85MB IDE hard drives. These babies were designed for the '386 and they come packing all the speed you'll need. Like *PC Magazine* said, ZEOS designs for speed. And for Quality Too.

ZEOS QUALITY. SECOND TO NONE.

When you buy your new ZEOS system you are buying *absolute Quality*. As an example, every ZEOS '386DX system comes with a 300 Watt power supply and *two* cooling fans. This costs more, it's better too. Much Better. We invest more in our power and cooling to help assure you years of trouble free operation. Even the small details can make the difference.

Like our floppy drives. We use only genuine Teac.* They are the best money can buy. The same is true of *all* the components of your system. Only *the very best* are used. Everything is top notch. Top quality. Top Value.

You'll especially like the value you find in our money saving ZEOS system packages. And when you opt for any package with 4 Megs of memory, we also include the new version of Microsoft*

10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but *eight* times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

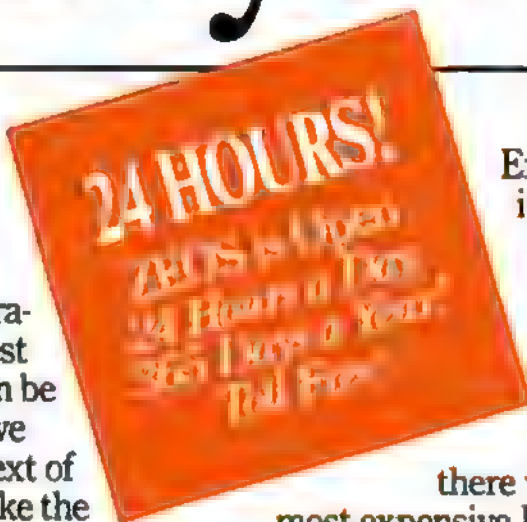
Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed:



Excellent. Compatibility: Excellent. Value: Excellent." *Personal Computing* said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

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Reason #10

You're Going to be Very Satisfied.

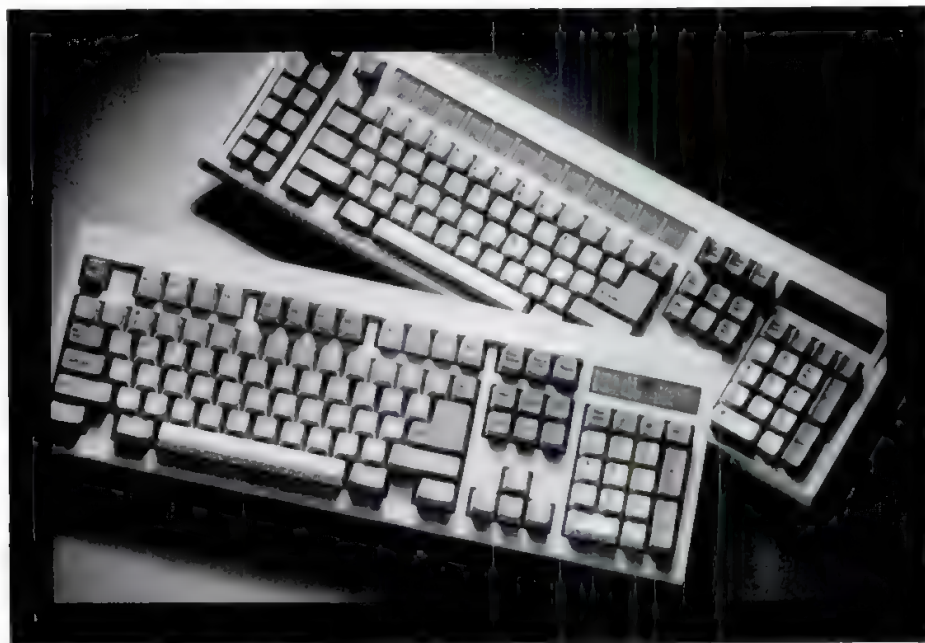
When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

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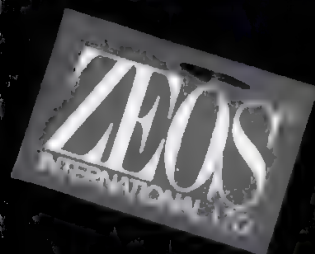
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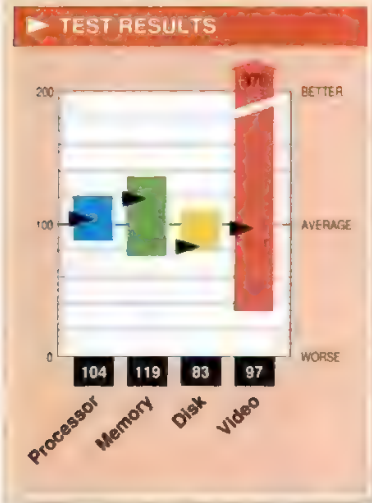
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PC Partner XL

BATTERY RUNDOWN TEST SCORE:
1 HOUR 53 MINUTES



In Short: Lack of space for an internal modem and a nonstandard, L-shaped cursor-key layout (with only four dedicated cursor keys) limit the appeal of Leading Technology's 6.8-pound 20-MHz PC Partner XL. The PC Partner is also hampered by a shorter-than-average battery life, a slow 6.7-MHz bus (and consequently a slow hard disk), and a six-month warranty—half that of other manufacturers.

battery and a couple of cables will weigh in at around 10 pounds—a pound less than some of the others in this roundup.

The Tangent/Micro Express's backlit supertwist LCD display is manufactured by Sanyo. This VGA display system shows a maximum of 16 gray scales. Small adjustment wheels mounted on the right side rim of the display panel give adequate control of screen brightness and contrast. The screen, which measures 5.4 by 7.5 inches, is amply sized and does a fine job of displaying *Windows* 3.0, although, as with all gray-scale LCD screens, the *Windows* colors leave a lot to be desired.

The keyboard of the Tangent/Micro Express machine is superior. It has good travel and feel, along with quiet operation. But most important, it has separate page- and cursor-movement keys, with the inverted-T layout that has become indispensable for most notebook users. The system's ten function keys are roughly two-thirds size and are conveniently located in the usual place across the top of the keyboard.

The Tangent/Micro Express's battery slides into a compartment on the bottom of the unit. The battery on the Micro Express version ran for 2 hours 8 minutes,



FACT FILE

Micro Express NB5620

Micro Express, 1801 Carnegie Ave., Santa Ana, CA 92705; 800-642-7621; fax: 714-852-1225.

List Price: \$2,224.

Tested Configuration: 2MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01, carrying case.

Options: 1MB RAM upgrade, \$150; 4MB RAM upgrade, \$450; upgrade to 40MB hard disk, \$250; upgrade to 60MB hard disk, \$350; 80387SX/20 coprocessor, \$399. External floppy disk drive, \$120; 2,400-bps modem, \$250; extra battery, \$200; numeric keypad, \$45.

CIRCLE 545 ON READER SERVICE CARD

Tangent 320N

Tangent Computer Inc., 197 Airport Blvd., Burlingame, CA 94010; 800-223-6677, 415-342-9388; fax: 415-342-9380.

List Price: \$2,183.

Tested Configuration: 2MB RAM, 20MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, 4.01, carrying case.

Options: 1MB RAM upgrade, \$100; 4MB RAM upgrade, \$400; 30MB hard disk upgrade, \$150; upgrade to 40MB hard disk, \$225; upgrade to 60MB hard disk, \$295; 80387SX/20 coprocessor, \$419. External floppy disk drive, \$150. 2,400-bps modem, \$159; with send/receive fax, \$259; with send-only fax, \$199. Extra battery, \$45; AC power adapter, \$70; car battery adapter, \$45; network adapter, \$695. Expansion chassis with 5 slots, \$595; with 8 slots, \$795. Numeric keypad, \$70.

CIRCLE 603 ON READER SERVICE CARD

MICRO EXPRESS

NB5620

TANGENT

320N

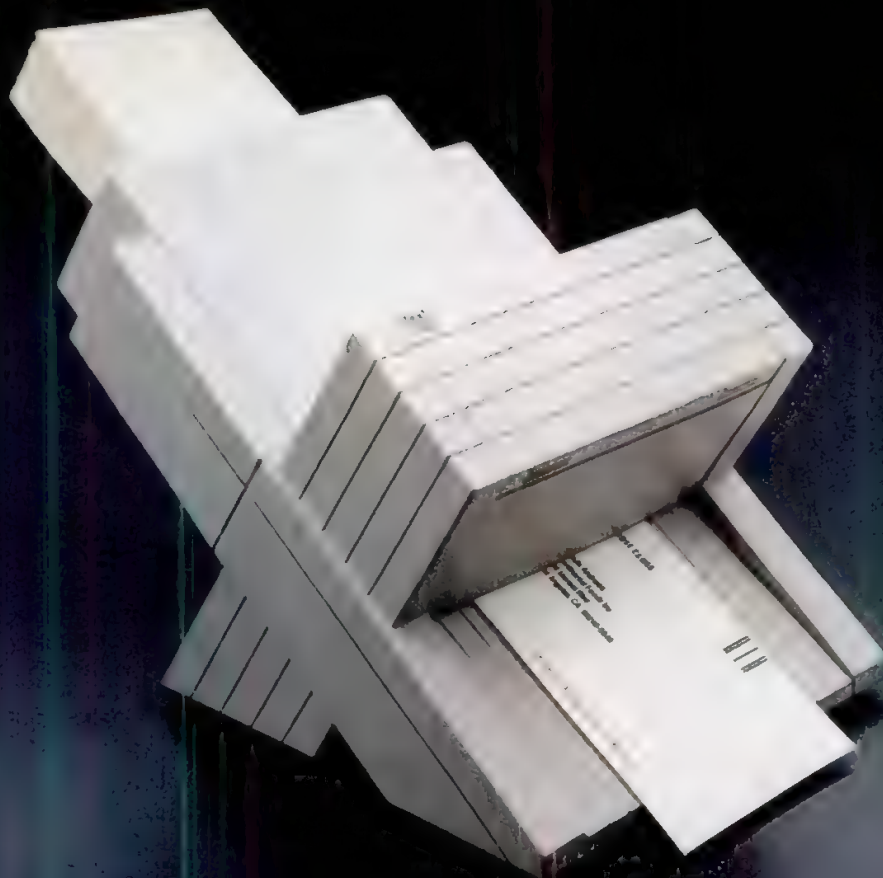
by Bruce Brown

Size, price, expansion, and speed are all good reasons to buy the 20-MHz 386SX Chicony-made notebook sold by Micro Express and Tangent. Called the Micro Express NB5620 or the Tangent 320N, each system, with a 20MB hard disk, sells for \$2,224 or \$2,183, respectively. Aside from batteries that last roughly 2 hours and no space for an internal modem, these identical notebook systems give you a fair return for your money.

At 7.1 pounds with battery and with measurements of 2 by 11.8 by 8.3 inches, the system is a little larger than the ideal notebook. But the 1.5- by 5.8- by 3-inch AC adapter weighs only 1.3 pounds and the standard leatherette case weighs 0.7 pounds. A complete system with an extra



User-friendly memory expansion and battery access on the Micro Express NB5620 and the Tangent 320N (shown here) indicate careful design.



Actual size: 8.7" x 8.5" x 8" (HWD)

Introducing the AddressWriter. The amazing new printer that takes the aggravation out of printing envelopes, postcards and labels.

With all the breakthroughs in office automation and computerization you'd think that by now there'd be an easy way to deal with envelopes. Well, there is: The AddressWriter™ from CoStar.

This neat little printer will shoot out a beautifully printed envelope, postcard, or label, complete with postal bar code, in seconds.

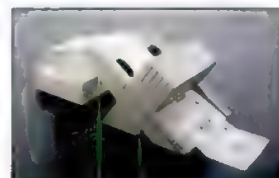
The AddressWriter comes with its own

memory resident addressing software compatible with DOS®, Windows™* and Netware® applications. With one keystroke, you can set the software to

automatically find the address in your letter, and print an envelope while your laser printer is printing your letter. Or you can set the AddressWriter to print the envelopes of a mail merge file while your laser printer prints the letters. If all you need are envelopes, print from the AddressWriter's built-in database, or from your favorite program.

The AddressWriter comes complete with printer, envelope catcher, software, cable and manual. Retail price is \$595.

For more information or the dealer nearest you, call 800-4-COSTAR. For additional information by fax, 24 hours a day, call 800-388-4888.



It becomes a great label printer with \$75 label feed attachment.

and the Tangent went on for 1 hour 41 minutes on PC Labs' Battery Rundown test. The difference in battery life is attributable to the computers themselves and not the batteries or chargers: We ran subsequent tests switching batteries and battery chargers between the two machines, and the Micro Express system consistently ran longer on battery power than the Tangent machine, though the differences grew somewhat less noticeable in subsequent rundowns.

Overall, however, 2 hours or less of battery operation isn't much, and carrying two extra batteries on a transcontinental flight also will add a couple more pounds to your bag. With the AC adapter attached and the system off, it takes 2 hours to recharge the battery and only 4 hours to

recharge with the system in use, both very good times.

The only battery conservation technique, set via disk-based software, slows the system down to 3 MHz and shuts off

**This Chicony-made
system's sleep mode
is compatible with
Windows 3.0.**

the LCD screen at inactivity intervals of 1 to 9 minutes. While this sleep mode, which is accessible only by time interval and not by a hotkey combination or by closing the cover, doesn't appreciably increase battery life (rated at 4 or more hours in sleep mode), it does offer compatibility with Windows 3.0, a feature shared by few other notebooks' sleep modes.

SIMPLE MEMORY ADD-ON

Adding memory to Tangent or Micro Express systems is simple. The standard 1MB RAM can be increased to either 2MB or 5MB total by adding a memory option card in a slot on the bottom of the unit revealed behind a simple slide-off cover. For the 1MB and 4MB memory add-on cards, Micro Express charges \$150

WHAT'S BEHIND GREAT BATTERY LIFE?

Sophisticated power management helps. But so does a big battery.

by Bill Howard

If you want maximum performance, auto racers say, there's no substitute for cubic inches. And when it comes to making your laptop run on and on, there's no substitute for a big battery. All other things being equal, if your laptop has a bigger battery, it's likely to run longer. The four laptops with the heaviest batteries finished first, third, eighth, and ninth on PC Magazine Labs' Battery Rundown test (See "Performance Tests: 386SX Notebooks"). And the Epson—one of the laptops with the lightest battery—finished dead last.

Take a look at the accompanying table. It measures how long each laptop runs for every pound of battery installed. If PC Labs' normal rundown test is something akin to a test of how far you can drive your car on a full tank of gas (no matter how big the tank or how inefficient the engine), this is a miles-per-gallon calculation.

In the 27 laptops reviewed, batteries weighed from 11 to 32 ounces. The battery efficiency champ, the Veridata, had average rundown performance (2 hours 8 minutes, right in the middle). But that's equal to 3 hours 3 minutes per pound of battery, since the Veridata power pack weighs just 11 ounces.

Why should you care about battery efficiency? Because you want the lightest laptop possible. If your laptop isn't very efficient, it may need a heavier battery to provide the 2-plus hours of life that seems to be the norm for laptops today. Take Compaq, for instance. To push battery life beyond 2 and a half hours (making it rank eighth-best), Compaq installed the second-heaviest battery.

Other notes on battery longevity and battery efficiency:

■ Slow but steady wins the race. The median 16-MHz laptop ran 10 to 12 minutes longer than a 20-MHz laptop when measured on a battery-life-per-pound basis. All other things being equal, we found that a 16-MHz CPU uses nearly 10 percent less power than a 20-MHz CPU.

■ Nickel hydride's supposed superiority isn't readily apparent—yet. Toshiba, the longevity champ (3 hours 8 minutes), claims its nickel hydride battery is 22 percent more efficient than nickel cadmium on a pound-for-pound basis. But we found that the Toshiba T2000SX was only marginally more efficient than the nickel cadmium-powered laptops. The T2000SX did have the longest battery life, but then only two other laptops had heavier batteries. Also, nickel hydride can't be recharged as many times as nickel cadmium, and it's more expensive to replace.

■ The Veridata, the efficiency champ, had one of the dimmer screens (even when cranked up to full brightness) and lacked a built-in floppy disk drive.

■ Laptops with twin battery packs get better battery life if you run both batteries simultaneously instead of running down battery A, then battery B, according to research that AT&T did in developing its Safari notebook. That's especially so if the vendor is conscientious and selects two batteries with matched power characteristics.

■ Minute variations from battery to battery explain some of the variance in battery life among the fraternal and identical twin laptops: ACT, Everex, Sanyo, and Zeos; ALR and Commax; Bitwise, Micro Telesis National, and Micro Systems; CompuAdd and Texas Instruments; Dataworld and Tandon; Micro Express and Tangent. Different BIOS versions, different chargers, and use of alternate vendors for displays also can affect battery life.

■ 386SL-based laptops due later this year, using Intel's energy-saving 20-MHz SL chip set, should have great standby life. Less clear is how efficient they'll be in normal operation. Informal rundown tests with a preproduction Zenith SL unit showed that it was no more efficient than non-SL-based laptops. But in standby or sleep mode, the SL chip set is far more efficient than traditional laptop designs.

and \$450 and Tangent charges \$100 and \$400—quite reasonable, given the high memory prices charged by other vendors.

Both vendors market this notebook system via direct sales with similar prices and service policies. Tangent currently offers a wider range of options. Along with many other notebook vendors, both Tangent and Micro Express are waiting for Conner Peripherals to catch up with the demand for larger-than-20MB hard disk options. By the time this article is published, they should be able to deliver systems with optional larger-size hard disks.

Micro Express sells its notebook with a 15-month parts and labor warranty with a 30-day money-back guarantee, and toll-free technical support. Service is obtained

by sending the machine back to the vendor, who will pay shipping costs both ways for the first four months and one way after that. Tangent pays shipping costs for repairs both ways throughout its one-year

warranty period and also offers a 30-day money-back guarantee and toll-free technical support.

Micro Express will sell a 40MB hard disk upgrade for \$250 over the base 20MB price and a 60MB upgrade for \$350 over base—rather inexpensive considering the competition's steep upgrade prices. Micro Express also sells an external 1.2MB floppy ddisk for \$120. Tangent offers 30MB, 40MB, and 60MB disk sizes for \$150, \$225, and \$295 over the base model and charges \$150 for an external 1.2MB floppy disk drive.

Tangent also sells an expansion box that plugs into the parallel port with five 16-bit slots, two half-height 5.25-inch drive bays, and a power supply for \$595. An eight-slot version sells for \$795. The expansion box works with I/O cards, external drives, and network cards via driver software that routes all signals through the notebook's parallel port. SCSI devices are not currently supported, nor are any external devices that can't coexist with the internal VGA circuitry or require special device drivers.

Adding memory to Tangent or Micro Express systems is simple.

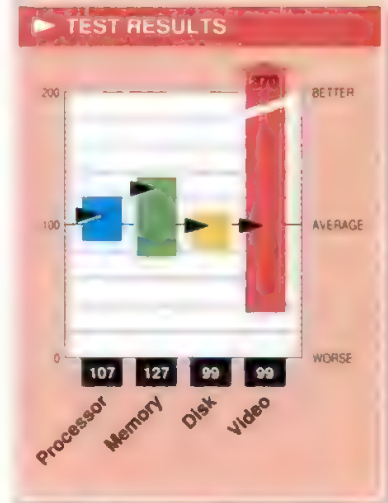
	Battery Run-down test Elapsed Time (hours:minutes)	Battery weight (pounds)	Battery life per pound (hours:minutes)
Veridata Execulite 386S (20 MHz)	2:08	0.7	3:03
Everex Tempo LX (16 MHz)	2:38	1.1	2:24
ACT Tempo 386SX (16 MHz)	2:37	1.1	2:22
Zeos Notebook 386 (16 MHz)	2:36	1.1	2:22
AST Premium Exec 386SX/20 (20 MHz)	2:38	1.2	2:11
Dell System 320N (20 MHz)	3:01	1.4	2:09
Sanyo MBC-18NB (16 MHz)	2:22	1.1	2:09
Micro Express NB5620 (20 MHz)	2:08	1.0	2:08
Toshiba T2000SX (16 MHz)	3:08	1.5	2:05
NMS 80386SX/16 Notebook (16 MHz)	2:15	1.2	1:52
16-MHz average	2:16	1.2	1:51
Overall average	2:10	1.2	1:48
Commax Notebook 386 (16 MHz)	2:10	1.2	1:48
20-MHz average	2:04	1.2	1:46
CompuAdd CompanionSX (20 MHz)	2:05	1.2	1:44
Tangent 320N (20 MHz)	1:41	1.0	1:41
Micro Telesis NBA386SX (16 MHz)	2:00	1.2	1:40
Bitwise 386SX/16 Notebook (16 MHz)	1:58	1.2	1:39
ALR Venture/16 (16 MHz)	1:58	1.2	1:38
Samsung NoteMaster 386S/16 (16 MHz)	2:23	1.5	1:36
IBM PS/2 L40 SX (20 MHz)	1:52	1.2	1:33
Compaq LTE 386s/20 Model 30 (20 MHz)	2:34	1.7	1:30
Epson NB3s (16 MHz)	1:02	0.7	1:29
TI TravelMate 3000 (20 MHz)	1:46	1.2	1:28
Leading Technology PC Partner XL (20 MHz)	1:53	1.3	1:27
Modern Computer Walkom NP-903 (16 MHz)	2:52	2.0	1:26
Twinhead Supernote 386SX (16 MHz)	1:50	1.3	1:25
Northgate SlimLite (20 MHz)	1:32	1.1	1:23
Tandon 386SX-20 (20 MHz)	1:51	1.4	1:19
Dataworld NB-320SX (20 MHz)	1:42	1.4	1:13

This table compares the power efficiency of 27 laptops by dividing the run-down time of each system (hours) by the weight of the battery (pounds). The results in the third column are in hours per pound of battery. Average for the 27 systems was 1 hour 48 minutes per pound of battery, scores ranged from a high of 3 hours 3 minutes (Veridata)

to a low of 1 hour 13 minutes (Dataworld). A system with high efficiency may have sophisticated engineering, superior battery construction, and a well-designed BIOS—or it may have fewer features that consume power. For Battery Run-down test results and battery life per pound, higher scores represent better performance.

Micro Express NB5620

**BATTERY RUN-DOWN TEST SCORE:
2 HOURS 8 MINUTES**



In Short: Chicony America manufactures this 20-MHz notebook sold by Micro Express. Weighing 7.1 pounds with battery, it is a terrific deal at \$2,224—as long as you don't need an internal modem. Superior performance (like that of its Tangent twin), Windows-aware sleep mode, superb keyboard (including an inverted-T cursor-key layout), and user-friendly memory expansion and battery access show careful design.

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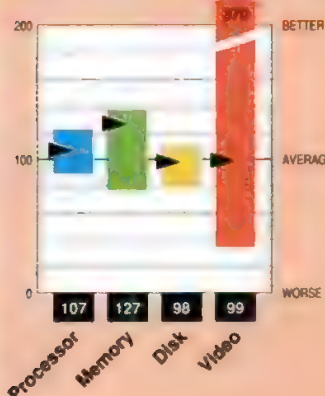
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CIRCLE 731 ON READER SERVICE CARD

Tangent 320N

BATTERY RUNDOWN TEST SCORE:
1 HOUR 41 MINUTES

TEST RESULTS



In Short: Like its Micro Express twin, the Tangent 320N tied for second place on our processor performance test and scored adequately in other areas. The keyboard was appealing, with its separate page-movement and cursor keys and inverted-T layout. Its battery didn't last long, though—1 hour 41 minutes compared with the ME's 2 hours 8 minutes. And alas for travelers, no space for an internal modem may make this one of-fice-bound.

The combination of a 20-MHz processor, good expansion capability, and a dynamite keyboard would make either the Tangent 320N or the Micro Express NB5620 notebook easy to recommend, especially considering the low price, but its slightly higher-than-average weight and its lack of space for an internal modem might hold you back.

MODERN COMPUTER

Walkom NP-903

by Ed Perratore

Modern Computer Corp., a new presence in the U.S., has been marketing a line of notebook PCs in Europe that includes the Walkom (NoteStar when sold through dealers) NP-903. The strongest selling point of this rugged—though heavy—model is a design intended for numerous expansion options.

Weighing 7.8 pounds with two batteries and 9.3 pounds with its leather case,

COVER STORY

386SX NOTEBOOKS

the \$3,500 NP-903 sells with a 20MB hard disk, Microsoft Windows 3.0, your choice of DOS 3.3 or 4.0, and a variety of utilities.

The NP-903's black case opens to allow screen positioning within a 135-degree arc. Along the left is the recessed power switch; beside it, a sturdy door shielding a 15-pin VGA port. Unfortunately, simultaneous displays aren't possible.

On the right edge, next to the 3.5-inch, 1.44MB floppy disk drive, you'll find a connector for an optional \$100 external keyboard or numeric keypad. But NP-903's main attraction is the dual docking ports on the back. Ordinarily the two batteries take up this space, but any one of a number of similarly shaped, unobtrusive modules can occupy it instead.

A 68-pin connector in the housing of the right-hand battery attaches to a \$150 expansion module that can hold an 8-bit card or a \$250 2,400-bps modem. Or you can plug in a \$600 Ethernet module (status lights on these modules would be a welcome enhancement). Other options include voice record, a \$600 send/receive fax/modem, and a \$300 expansion unit that adds two serial ports to the one paral-



FACT FILE

Walkom NP-903

Modern Computer Corp., One World Trade Center, #7969, 79th fl., New York, NY 10048; 212-488-5916; fax: 212-488-5918.

List Price: \$3,500.

Tested Configuration: 2MB RAM, 20MB PrairieTek hard disk, 1.44MB floppy disk drive, VGA LCD, DOS 4.01, external CRT adapter, carrying case.

Options: 4MB RAM upgrade, \$200; upgrade to 60MB hard disk, \$500. External floppy disk drive, \$360. 2,400-bps modem, \$250; 2,400-bps modem with send/receive fax, \$600. Extra battery, \$70; car battery adapter, \$125; Ethernet network adapter, \$600; expansion chassis, \$300; numeric keypad, \$100.

CIRCLE #47 ON READER SERVICE CARD

lel, one serial port you already have. Several more modules are expected before year end.

Remove the left battery, and you'll expose an external floppy disk drive connector. An external drive can be configured in the CMOS setup of the AMI BIOS for either density of 3.5- or 5.25-inch drives.

CRISP GRAY SHADING

The NP-903's Sanyo triple-supertwist screen showed some of the crispest gray



However innovative, Modern Computer's Walkom NP-903 is a relatively expensive and heavy machine.

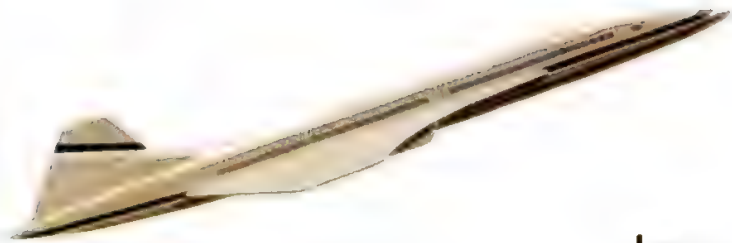
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MastersPort 286 MastersPort 386SX SupersPort 486SX SupersPort 486

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	MastersPort™ 286	MastersPort 386SX	MastersPort 386SL	SupersPort™ 486SX	SupersPort 486
Processor—Speed	286—12.0MHz	386SX—20.10MHz	386SL—20.50MHz	486SX—20.10MHz	486—25.12.5MHz
Co-Processor	80C287 socket	80487SX socket	80487SX socket	Upgradable to 486 20MHz	Integrated
Memory (Std. Max.)	1MB/2MB	2MB/4MB	2MB/8MB (64K cache)	4MB/16MB	4MB/16MB
Hard Disk Drive	40MB	60MB	60MB	120MB	120MB
LCD Size	Backlit 8.85"	Backlit 8.85"	Backlit 8.85"	Edgelit 10.1"	Edgelit 10.1"
Video/Gray Scales	VGA 16	VGA 16	VGA 32	VGA 64	VGA 64
Power Management	• Suspend/Resume • Sleep mode • Low battery operation	• Suspend/Resume • Sleep mode • Low battery operation	Premier System Management™ • Standby/Resume • Rest/Resume • Panic Save • Unattended communications	Intelligent Power Management™	Intelligent Power Management
Software	MS-DOS® included	MS-DOS included	MS-DOS pre-installed; Microsoft Windows® 3.0 included	MS-DOS and Microsoft Windows® 3.0 pre-installed	MS-DOS and Microsoft Windows® 3.0 pre-installed
Weight (with battery)	6.6 lbs.	6.6 lbs.	6.8 lbs.	15 lbs.	15 lbs.

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CIRCLE 732 ON READER SERVICE CARD

shading and contrast that we've seen, though its 8-bit VGA circuitry also turned in the slowest video scores.

The full-size keyboard allows for swift touch-typing, but the keys are a bit noisy: The Spacebar of our test model consistently responded with a dull clank that could become irritating.

This system's score of 2 hours 52 minutes on PC Magazine Labs' Battery Rundown test is excellent. Keep in mind, however, that the battery weighs almost 2 pounds, giving it a below-average weight-to-time ratio of only 86 minutes per pound

against an average of 135 minutes for batteries in 16-MHz machines. Video, hard disk, and CPU power-down are individually configurable through either setup or the included PowerSave utility. PowerSave also lets you set a sleep mode interval, although sleep mode won't work either in *Windows* or in OS/2. Nor is there

BATTERY LIFESAVERS: Smart Power Management Can Make Your Battery Last Longer

by Bill O'Brien

All portables use power-saving techniques to extend what is essentially a fixed ratio of battery strength to the power drained by all of the components in your notebook—a strict one-to-one ratio based on electrical law. Thankfully, portable vendors have spent the last few years learning how to cheat that law.

Notebook power-saving techniques typically include screen blanking and hard disk power-down, as well as a feature that downshifts the operating speed from, say, 16 to 8 or even 2 MHz during those periods of inactivity. Many notebook power-saving schemes also include a standby mode (sometimes called "suspend and resume"); standby can be implemented in several different ways. For the majority of the notebooks, (such as AST, Dataworld, Northgate, Tandon, among others), standby simply means activating all of the power-saving features at once by closing the lid or pressing a simple key combination.

For IBM, Compaq, and Toshiba, standby mode means literally shutting off every component of the system, including the processor, while keeping only the contents of memory active. Toshiba goes two steps further: The T2000SX's CMOS RAM draws considerably less power than standard RAM, and a separate internal nickel cadmium battery preserves the contents of that RAM for about 12 hours after your main battery has died.

KILLING BATTERY KILLERS

Power-saving features are, of course, a shotgun approach to the problem. They minimize battery drain, but they cannot mitigate the other problems presented by the applications software,

SIX TIPS FOR LONGER BATTERY LIFE

- Run white-on-black text display
- Keep the brightness to its lowest acceptable level
- Turn off the modem and comm port
- Run programs from a RAM disk
- Use the slowest processor speed whenever possible
- Keep a fully charged spare battery handy

such as repeated disk accesses.

Of course, turning off the internal modem and speaker (when you can) is a good idea. That alone can save several hundred milliamps—even with the small piezoelectric speakers most notebooks use.

Your screen is the greatest battery killer of any notebook component. Running it in inverse mode (black type on a white background) can cost you as much as 25 percent of your battery time. Normal mode (white on black) sends power only to those pixels that are displayed, not the entire screen. If you must run inverse, keep the brightness as low as possible. In tests on Northgate, Toshiba, Nan Tan, and AST notebooks, we found you can lose 2 to 5 percent of your battery life by running at full brightness instead of at midpoint on your controls.

Setting up the proper interval for hard disk power-down will depend on what applications you're running. In

general, it takes nearly three times as much power to restart your hard disk frequently than just to let it run. If you use programs like *Windows*, *Microsoft Word*, and others that frequently move data to and from the disk, you may find that you've reached the power-down interval just when the application wants to access the drive.

The best (though expensive) solution is to fill your portable with RAM and turn those extra megabytes into a RAM disk. Setting the RAM drive as the destination for any temporary disk files or making it the program's source drive (by transferring all of the program and data files to the RAM disk and running it from there) takes much less power than using your hard disk would.

You can also slow your system down, especially when you are running applications like word processing and telecommunications. In comparative PC Labs Battery Rundown tests performed on notebooks from AST, Compaq, Dataworld, and Toshiba, downshifting to the compatibility speeds (typically 8 MHz) from the standard 20-MHz speed netted mixed but noticeable results. Dataworld lasted 38 minutes longer (a 31 percent gain); Compaq gained only 5 minutes (4 percent); Toshiba, about 10 (5 percent); and AST, 15 (9 percent).

Whenever possible, let both your main and standby batteries charge overnight—even if your system claims a 2-hour recharge time. Fast charging may get you up and running quickly, but in most cases it brings your battery up to only 85 or 90 percent of its capacity. Finally, always carry a spare, fully-charged battery. Your case may weigh a pound or two more, but you'll double your system's battery life. ■

**"We make Windows™ scream
— so you don't have to"**

... Ho



any warning if you close the case without powering down, until about 20 minutes of power remain.

Modern Computer offers a one-year parts-and-labor warranty administered through the dealer or distributor from whom you've purchased the system. All sellers contracted to sell Modern Computer's PCs keep a stock of tested system boards for a quick swap if you run into trouble.

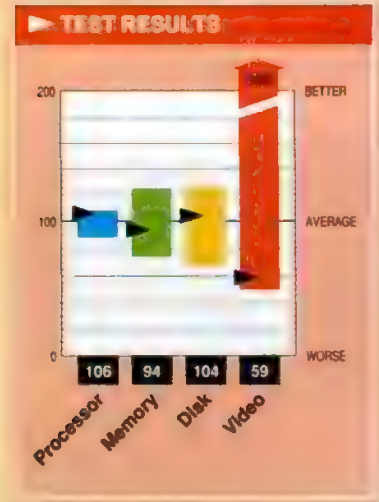
EXPENSIVE EXPANSION

Modern's Walkom NP-903 is bound to impress prospective buyers, particularly through its crisp display and versatile, if expensive, expansion. As with any notebook PC, you're paying for the scaled-down technology on top of the module's actual capabilities.

For some, Modern Computer's Walkom NP-903's above-average weight may offset some of its benefits, but many power users who need a variety of connectivity options will consider the trade-off well worth it.

Walkom NP-903

BATTERY RUNDOWN TEST SCORE:
2 HOURS 52 MINUTES



In Short: The 16-MHz Walkom NP-903 from Modern Computer Corp. weighs in at nearly 8 pounds and costs \$3,500—heavier and more expensive than the average for our roundup. But an innovative expansion scheme gives user flexibility not found anywhere else, using modules that fit into the two battery docking stations (offering Ethernet and fax/modem capabilities, among others). The dual-battery system lasts longer than average, but at a significant cost in weight.

COVER STORY 386SX NOTEBOOKS

NORTHGATE SlimLite

by Julie I. Cohen

Northgate's 20-MHz SlimLite notebook comes with a vivid display, weighs about a pound less than most, and is built for ease of use. At \$3,299 for a system with 3MB of RAM, a 20MB hard disk, DOS 4.01, *Windows 3.0*, and Stac Electronics' data compression program, *Stacker*, the 6.2-pound, 2- by 11- by 8.5-inch SlimLite also competes well in price.

Northgate has found a unique way to make the RAM, coprocessor, and modem slots user-accessible: Hide everything under a removable keyboard. Use a letter opener or screwdriver to pop the keyboard, and you can bring this system up to 5MB with a 4MB module (a \$299 upgrade). An 80387SX coprocessor and 2,400-bps MNP 5 modem (\$225) are just as easy to install.

You can't get to the hard disk, however. Once you choose a model, there's no upgrade. We tested the 23-millisecond, 20MB Conner drive because 40MB units have been in short supply. By late summer, a few 40MB versions should be

PC
MAGAZINE

FACT FILE

Northgate SlimLite

Northgate Computer Systems Inc., 7075 Flying Cloud Dr., Eden Prairie, MN 55344; 800-548-1993; fax: 800-323-7182.

List Price: \$3,299.

Tested Configuration: 3MB RAM, 20MB Conner hard disk, VGA LCD, 1.44MB floppy disk drive, DOS 4.01, *Windows 3.0*.

Options: 4MB RAM upgrade, \$299; upgrade to 40MB hard disk, \$300; 60MB hard disk, \$600; coprocessor, \$399. 2,400-bps modem with MNP 5 data compression, \$225; extra battery, \$155; A/C power adapter, \$99; carrying case, \$69; leather carrying case, \$189.

CIRCLE 849 ON READER SERVICE CARD

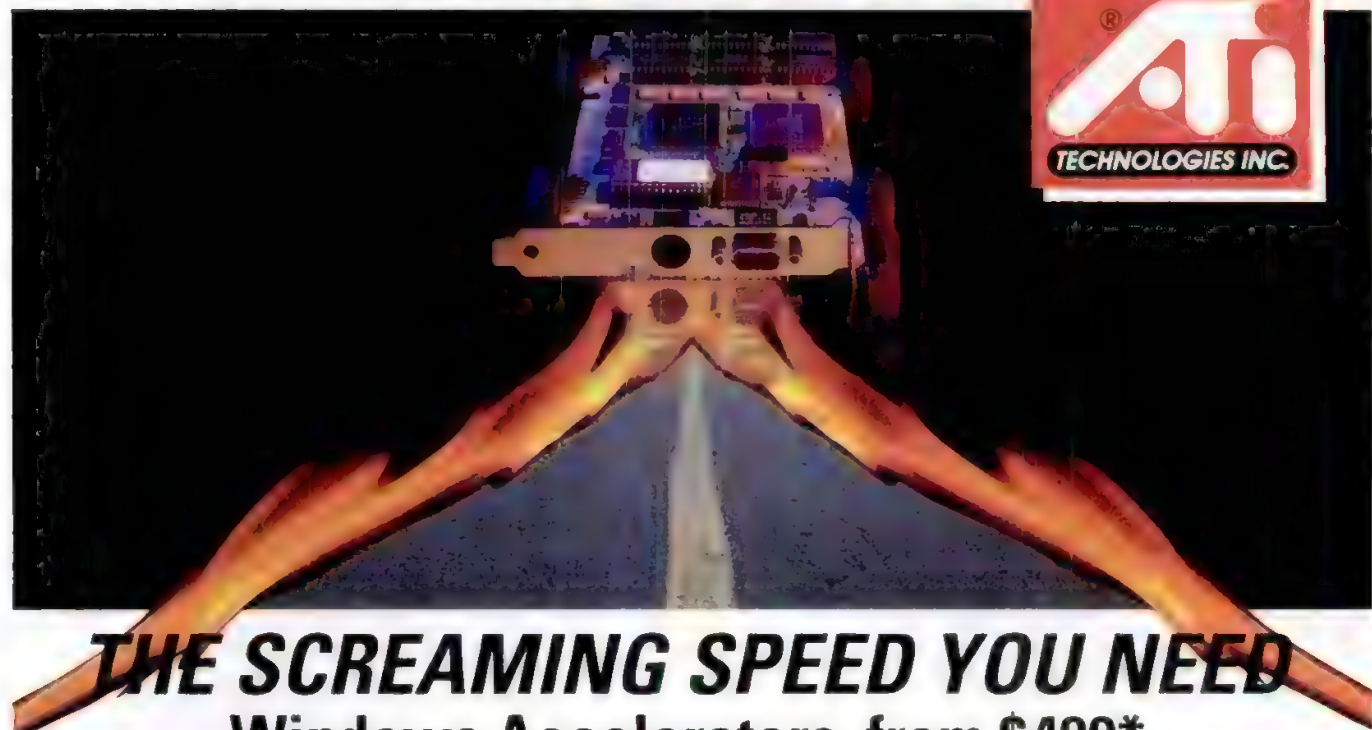
available for about \$300 more than the 20MB version. But by that time Northgate expects to ship most of its units with an ultra-lightweight, glass-platter 60MB hard disk from Areal (\$600). Go for the larger drive—especially if you plan to run *Windows* and other storage-intensive programs.

THE BIG THREE

If you ranked the Northgate SlimLite's success in three crucial areas—video, keyboard, and battery life—the display would come in first, keyboard second, and bat-



The Northgate SlimLite's removable keyboard gives the user easy access to many of the system's options.



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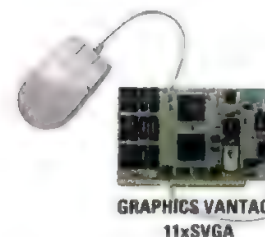
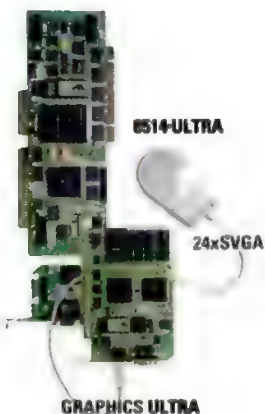
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- Run-on sentence
- Misused verb
- Misused pronoun
- Misused article
- Wrong verb form
- Misused word
- Possessive use
- Is this correct?
- Repeated word
- Capitalization

STYLE RULES

- Passive voice
- Split infinitive
- Long sentence
- Sentence length
- Difficult sentence
- Use verb form
- Long paragraph
- Start with but
- Conjunction start
- Weak sentence start
- End with preposition
- Negative sentence
- Use simpler terms
- Use simpler word
- Consider omitting
- Ambiguous wording
- Cliche
- Weak wording

- Overused phrases
- Single word quote
- Contraction

USAGE RULES

- Colloquial & slang
- Archaic
- Sexist
- Legalese
- Computer term
- Vague
- Wordy
- Redundant
- Questionable word
- Not a word
- Offensive
- Rephrase
- Modified absolute
- Misleading euphemism
- Negative
- User flag

PUNCTUATION RULES

- Missing question mark
- Unnecessary comma
- Missing comma
- Misused semicolon
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- Reversed punctuation
- Unbalanced quote
- Unbalanced bracket
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- Unusual punctuation

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INGRAM LABORATORIES STUDY

Statistics	Right Writer 4.0	Grammatik	Correct Grammar
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Incorrect Flags	336	701	554
Error Rate	8.0%	20.4%	24.4%

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The screenshot shows the Microsoft Paint application window. The title bar reads "File Edit View Route (none) Screen Help". The main canvas is a light blue background with a black outline of the United States. A red line is drawn across the map, representing a route. A text box with a black border is positioned in the center of the map, containing the text: "Route 1, 1200 miles, 25 hrs 9 min". The text is in a red, monospaced font. The status bar at the bottom of the window shows "Paint - 100%".

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and frustration. In fact, surveys show that AutoMap can easily save up to 20% in driving time and related costs. There's even a built-in quiz to test your knowledge of geography.

One of the great joys of automobile travel is just takin' it easy and seeing the country. I used AutoMap recently on a family trip to chart a course through the Carolinas (nothing could be finer!) and in particular, the Smokey Mountains. It was early Spring and we had a long list of things we wanted to see — the historic charm of Asheville, Raleigh, Gatlinberg and the Smokey Mountain National Park. Of course, we needed to stop by Chapel Hill and from there continue on through to Charlotte (to see my wife's great-aunt). The kids wanted to go tubing in the crystal-clear waters that cascade from the mountains near Cherokee and I was looking forward to visiting a tiny lake near Nantahala I had first fished as a boy. And we wanted to do it all without ever getting on a super highway.

We threw it all into AutoMap and instantly had detailed maps, printouts and directions. AutoMap provided several different routes that would let us all do exactly what we wanted. It gave us travel times, mileage, information on hotels and the parks themselves. AutoMap also provided information on the cities we wanted to visit, and precise directions (including landmarks) for the most scenic drives in and out of each of them. What a great vacation planner!

I'm putting AutoMap to work in planning my upcoming business trip to California. Being from Florida, Silicon Valley is a whole new world to me. My trip isn't until next fall, but I feel like I know the area like the back of my hand. AutoMap and I have put together the fastest way for me to make the most of my time out there. I simply set up my appointments, then gave AutoMap the details on my itinerary. I saw a map on the screen that displayed my route along with a complete set of printed directions. It took just a few minutes to take care of the whole thing. As I add appointments, I simply tell AutoMap and it reworks the itinerary to accommodate them. It is amazing. No wonder it's been a consistent top-seller here at Tiger since it was released.

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tery life a distant third.

The SlimLite's display, made by Sharp, fills the entire 5- by 7-inch screen, and the 32 gray shades have excellent contrast, whether you're running paper-white or reverse mode. The video is somewhat slow compared with that of other 20-MHz systems. Still, you'll be hard pressed to find a cleaner-looking display.

Northgate got the keyboard almost, but not quite, right: It has standard 3-millimeter travel and dedicated cursor keys set in the inverted-T layout. You'll have to get used to the double row of miniaturized function keys, however. Northgate gives you 12, but they measure only 5/8 inch from center to center.

Unlike the display and keyboard, the battery doesn't hold its own: At maximum power consumption, the Sanyo battery lasted only 1 hour 32 minutes on PC Magazine Labs' Battery Rundown test—a half hour short of the average score. We tested a second battery, but found little improvement: 1 hour 35 minutes. Northgate acknowledged that early pro-

duction units (such as the one we tested) had short battery life and said it has since modified its charger to allow a 90 percent charge in 3 hours.

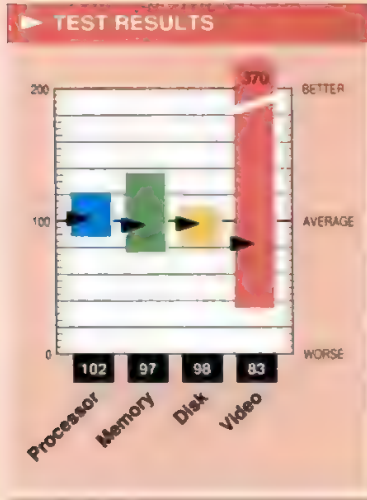
Fortunately, keeping a spare isn't a chore. The small, rectangular 1.1-pound nickel cadmium battery is far less bulky than the dynamite sticks found in some other systems.

If you use the easily accessible power-saving features faithfully, Northgate says you can stretch battery life to 2 hours or more. Just choose the setup (a simple hotkey combination), then push Ctrl-Alt-End to access a sleep mode. The hard disk spins down, the screen's backlight turns off, and the CPU powers down to 4 MHz.

A second hotkey combination lets you shut down the display completely, and a third lets you change from paper white to

Northgate SlimLite

BATTERY RUNDOWN TEST SCORE:
1 HOUR 32 MINUTES



In Short: At 6.2 pounds, Northgate's 20-MHz SlimLite weighs nearly a pound less than many of its competitors. A crisp, bright, 32-gray-scale display is another plus, though the system scored poorly on our video benchmark test. Drawbacks include short, 1.5-hour battery life and a double row of undersized function keys on an otherwise great keyboard. Removing the keyboard exposes the motherboard for easy memory and modem addition.

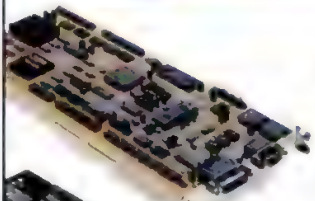
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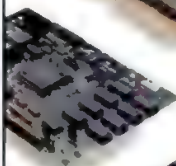
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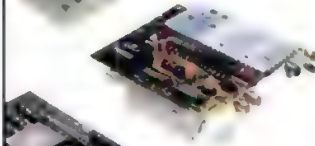
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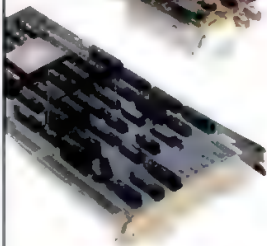
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the more efficient reverse mode. These key combinations won't work in the *Windows* environment, but they won't hang the system if you forget to disable them before running *Windows*, either.

Northgate's documentation is easy to understand, and its warranty policy is comparable to that of many other vendors: one year on parts and labor, with overnight replacement of failed parts where necessary. Tech support is a toll-

free phone call, and on-site service from NCR is free for a year.

At 6.2 pounds and with a display that's a must-see, the SlimLite has plenty going for it—though its battery needs improvement. You may never have to pop the keyboard, and you may set the power-saving features once and forget them, but such ease of use is always welcome.

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Maximum memory	240 pages	70 pages
Warranty	2 years	1 year
Price	\$995	\$1895

specifications as of June 1, 1991

SAMSUNG

NoteMaster 386S/16

by Greg Pastrick

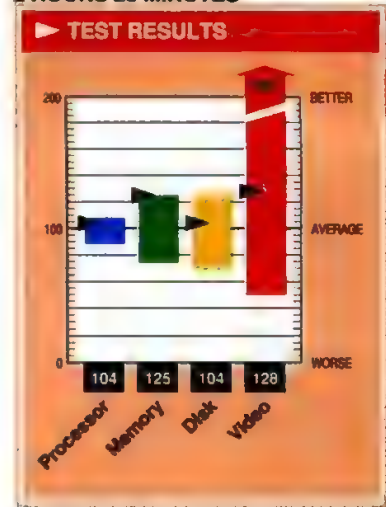
Samsung's NoteMaster 386S/16 comes with *Windows 3.0*, *LapLink III*, a hearty nickel cadmium battery that lasts nearly 2.5 hours, and a sidelit screen. At \$3,698 for our standard configuration, this system has just enough extras and competitive computing power to make it a decent buy, especially if a 20-MHz processor is not a must. And if you need simultaneous dual display capability, this system is your only choice.

Compared with a truly lightweight notebook like the 6-pound Epson NB3s, the NoteMaster (with its 1.5-pound battery) might seem a bit heavy. But even if you count its 1.2-pound external power supply, you've got mobile 386 computing power at under 9 pounds.

The NoteMaster's features are fairly typical of this class, with some exceptions. In its favor, the NoteMaster is the

Samsung NoteMaster 386S/16

**BATTERY RUNDOWN TEST SCORE:
2 HOURS 23 MINUTES**



In Short: Simultaneous dual-display capability, above-average 16-MHz performance, nearly 2 and a half hours of battery life, and the standard inclusion of *Windows* and *LapLink III* make the Samsung NoteMaster 386S/16 worth a look. But you'll have to contend with a nonstandard cursor layout and a sleep mode that doesn't work with *Windows*. Including the optional modem in the NoteMaster's \$3,698 price tag would make this system more roadworthy.

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CIRCLE 155 ON READER SERVICE CARD

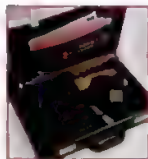
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Yet when you need your PC away from the office, Moby Brick's versatility offers an alternative to the limitations of laptops and the hassle of multiple machines. It's simple—at your frequent destinations, keep a full-size keyboard and color monitor and just carry the Brick in between. For travel, add the LCD display module to convert Moby Brick into a full featured AC portable.



Massive Power and Storage

Moby Brick is only about the size of a ream of copy paper and weighs 8.9 lbs., yet it packs full desktop power with either a 20 MHz 486SX or 33 MHz 486DX processor with up to 32 MB RAM. The new Intel 486SX is faster than a 33 MHz 386DX; the 486DX is twice as fast and includes a built-in numeric coprocessor. A modular processor board allows easy upgrades from the 486SX to the 486DX at any time.

Bricks use fast, reliable IDE Conner hard disks ranging from 44 MB up to 510 MB. The unique BIOS integrated disk cache (up to 8 MB) offers lightning quick access times. The bus is selectable between 8 MHz (AT standard) or 10 MHz which improves video, disk and network performance. Other standard features include a 2,400bps modem, 3.5" 1.44 MB floppy, 180 pin docking connector and an ISA 16-bit internal half length expansion slot. The "Stretch" Brick, which is 7" longer, accepts one full and one half length card. The rugged aluminum case with shock

absorbing rubber corners is available in granite or beige along with color coordinated keyboards and monitors.

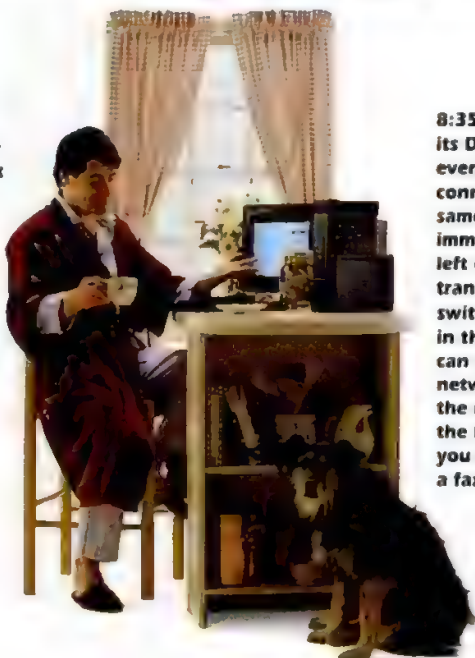
Extraordinary Graphics

Moby Brick features built-in 16-bit Super VGA graphics with 1 MB RAM. Maximum resolution is 1024 x 768 non-interlaced. The Edsun CEG (optional at no extra charge) provides antialiasing to double the apparent resolution and provides 32,000 simultaneously displayable colors for stunning photo-realistic graphics. Now you can say good-bye to the jaggies, even on low resolution 640 x 480 monitors or overhead LCD projectors. Fast, HI-RES drivers for all major applications are provided, including a Display List Driver for Autocad.

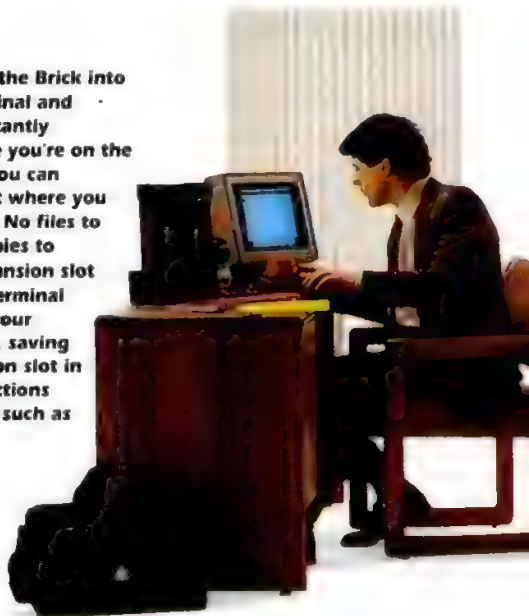
Good to Go

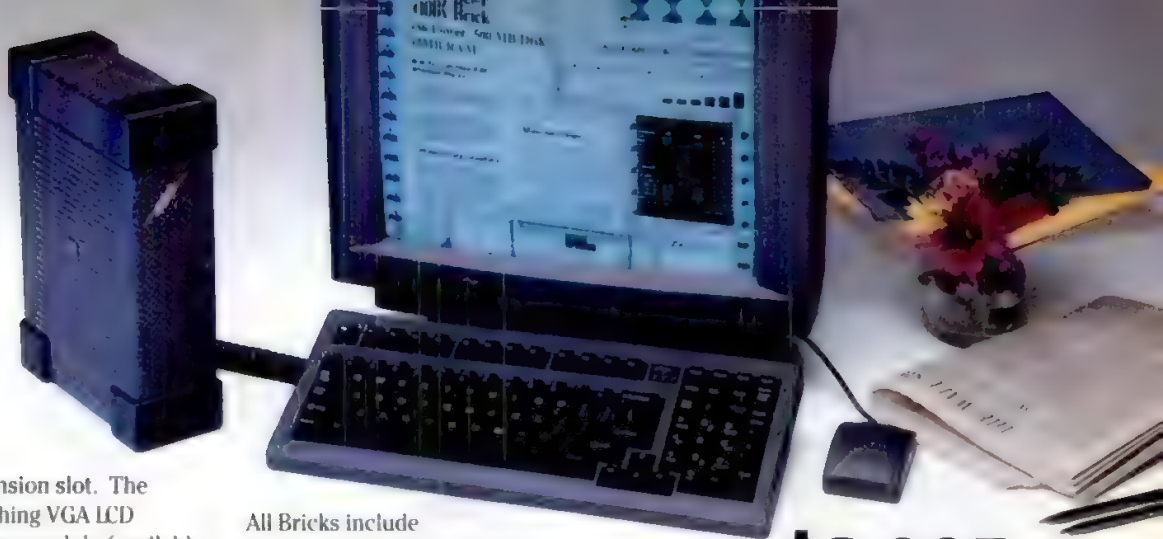
The innovative Ergo design provides perhaps the best benefit—versatility. You can use the same Moby Brick as a fast, quiet, stylish desktop at each of your regular destinations, such as your home and office. The optional Docking Terminal provides instant hook-up of all cables as well as a second 16-bit 3/4 length

6:25 a.m. You can start your day before heading to the office. An hour of quality work time before the onset of office interruptions (or at home in the evening) can be the most productive time of your day. With up to 510 MB of storage you can keep everything with you. All your files, addresses, even the ones you didn't think you needed, are at hand.



8:35 a.m. Drop the Brick into its Docking Terminal and everything is instantly connected. Since you're on the same computer you can immediately start where you left off at home. No files to transfer, no floppies to switch. The expansion slot in the Docking Terminal can be used for your network adapter, saving the internal option slot in the Brick for functions you need off-site such as a fax board.





expansion slot. The matching VGA LCD display module (available in August) turns Moby Brick into a portable, go anywhere solution. The LCD features a 64 gray scale controller and the latest Sharp thin film, super twist, backlit LCD technology.

Innovative Software

The Brick's system software has features not available in any other PC. (You might expect this from Ergo, since we're a leader in DOS Extender software with customers like Borland, Fox, and Cadam.) This includes a reprogrammable BIOS with user tunable keyboard control, password protection, and non-volatile owner identity. Updates to the latest release are just a phone call away. This BIOS also includes an integrated disk cache that is significantly faster than add-on software caches. System and video shadow RAM are provided, plus a (192K) block of high memory above 640K for loading high TSRs, networks and other resident utilities.

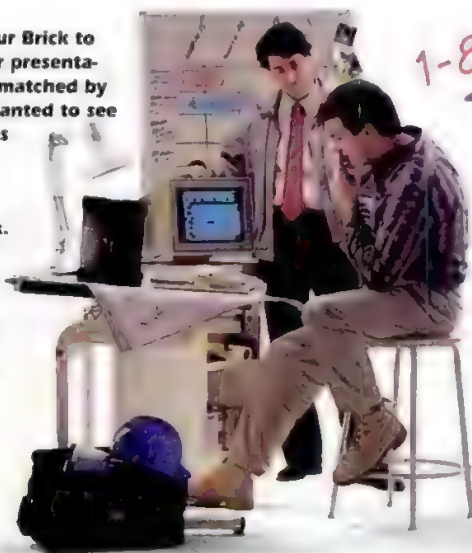
All Bricks include the new DOS 5.0, and your choice of Windows 3.0 plus Adobe ATM with 13 fonts, a Logitech mouse or DESQview/386 with QEMM. Whichever environment you choose, your Brick will come fully set up, fine-tuned and ready to go. There's even on-line Hypertext manuals for the Brick and DOS. All Bricks are 100% IBM AT-compatible and support DOS, OS/2, UNIX, X/Windows and Novell.

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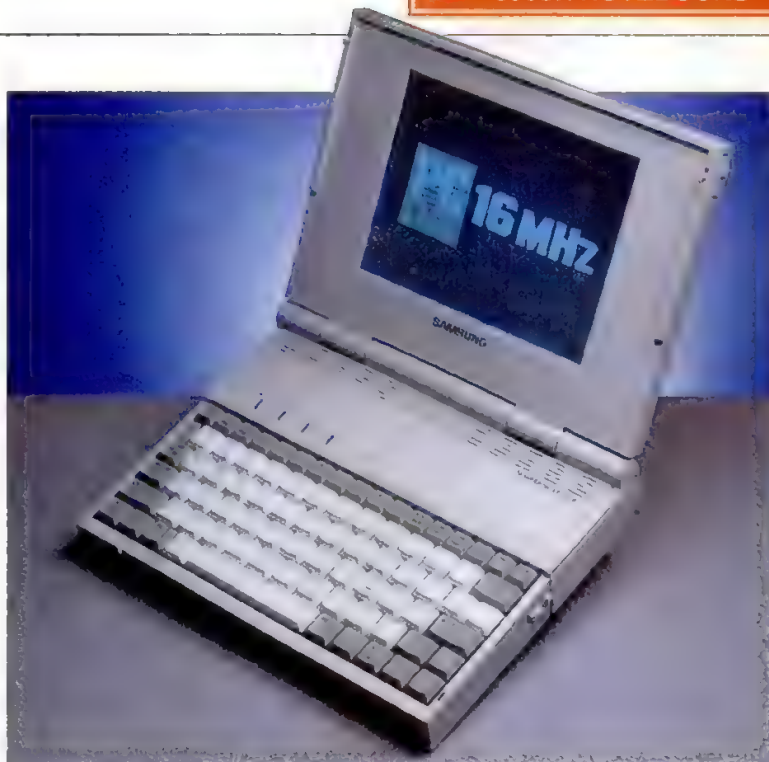


61-2-744-0772



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CIRCLE 479 ON READER SERVICE CARD



The Samsung NoteMaster 386S/16 is a solid roadworker for a reasonable price, nonstandard cursor key arrangement aside.

only PC in this group that allows you to see a presentation on your screen and a monitor at the same time, thanks to its Chips and Technologies video chip set. With other notebooks, if you want external display, you can't see it on your screen at the same time.

You have to settle for a cramped keyboard, though: The NoteMaster's center-to-center key spacing is a scant 0.5 inch,

rather than the 0.75-inch standard on most portables. And if you dislike the nonstandard L-shaped cursor-key configuration, you'll regret the omission of an external keyboard connector on the NoteMaster. Fn combinations control the embedded keypad, PgUp, PgDn, toggling CPU speeds, calling the system status window, and switching between the LCD and external display.

The NoteMaster comes standard with 1MB RAM. The system's memory is expandable to 5MB at reasonable prices on an easily installed proprietary card in 1MB, 2MB, and 4MB configurations for \$199, \$349, and \$649. What's more, Samsung offers 2,400-bps modem cards (with and without 9,600-bps send-only fax for \$249 and \$329, respectively) that slide neatly into the same slot compartment as the add-in memory. The user can also install a math coprocessor, though an upgrade from the 20MB, 23-millisecond Conner hard disk to a 60MB unit (\$499) requires a trip to a professional service center.

Power-saving features are managed through the system status window, which is popped up on-screen. This window shows settings for disk and screen time-

outs, LCD modes, and the system suspend/resume mode. The window also displays a battery gauge, an incoming-call system wake-up switch for the optional fax/modem board, and settings for the smart sleep-mode feature, which monitors keyboard inactivity and puts the system into a low-powered sleep after a timed interval. The NoteMaster's sleep mode is not fully Windows compatible. The system will hold the contents of memory for approximately 30 minutes with suspend/resume active.

A scan of the PC Magazine Labs test results shows that the NoteMaster is solidly competitive with the 16-MHz group of portables reviewed here, with clearly above-average scores on the conventional memory and screen routines: It was tops on the memory test. At 2 hours 23 minutes, battery life was quite good, too.

Samsung's standard one-year parts-and-labor warranty for the NoteMaster includes a Monday-through-Friday toll-free 7 A.M. to 5 P.M. P.S.T. support line (800-446-0262) and a 24-hour product support BBS (408-434-5684). Additional national on-site service is managed by Intellogic Trace out of San Antonio, Texas. For an annual fee of \$25, Samsung offers an executive support program that guarantees shipment of a replacement system within two business days should the NoteMaster break down.

Based on its performance, good screen, standard software, and support features, the NoteMaster 386S/16 is a solid roadworker for a reasonable price—but only if you can live with its nonstandard cursor key arrangement, and its non-Windows-compatible sleep mode.

TOSHIBA T2000SX by Bill Howard

There's nothing wrong with Toshiba's 16-MHz T2000SX that a week at the fat farm wouldn't cure. The T2000SX deserves points for its pioneering use of nickel hydride battery technology, idiot-proof auto-resume, and solid keyboard with all eight cursor keys (pay attention, Compaq). But the 6.9-pound T2000SX sits on the upper end of what you'd call a state-of-the-art notebook computer in heft, the CPU ticks at 16 MHz (despite the T2000SX name) when others have 20, and you might just suffer heart failure



FACT FILE

Samsung NoteMaster 386S/16

Samsung Information Systems America Inc.,
3655 North First St., San Jose, CA 95134;
800-446-0262; fax: 408-434-5653.

List Price: \$3,698.

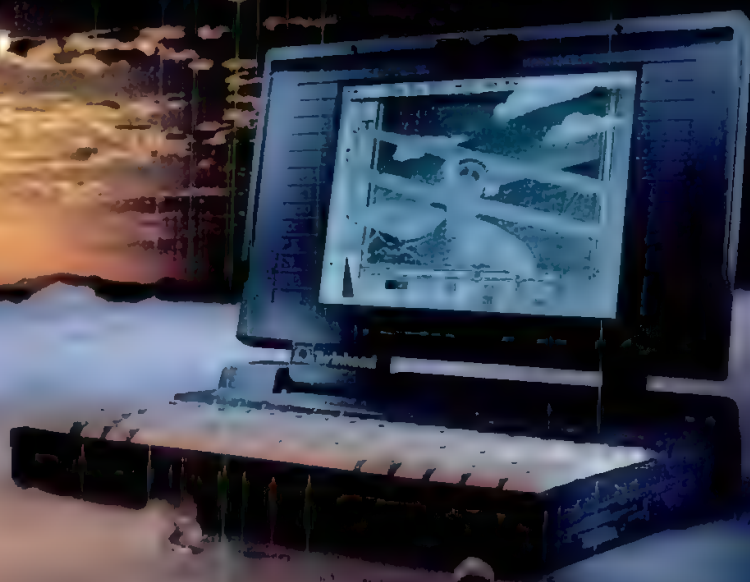
Tested Configuration: 2MB RAM, 20MB
Conner hard disk, 1.44MB floppy disk drive,
VGA LCD, DOS 4.01, Windows 3.0, LapLink
3.0, carrying case.

Options: 1MB RAM upgrade, \$199; 2MB
RAM upgrade, \$349; 4MB RAM upgrade,
\$649; upgrade to 60MB hard disk, \$499;
2,400-bps modem, \$249; 2,400/9,600-bps
modem with send-only fax, \$349. Extra
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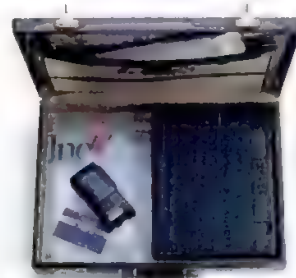
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Twinhead

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Supernote 386SX/16 features: 16 MHz 80386SX processor, 80287SX co-processor, 40 MB hard drive, 2 (or 4) MB, 32-shade, visible CCRT 8.75" LCD 640x480 VGA display, 1.44 MB floppy drive, SmartCharge AC adapter/recharger, 1 analog video, 1 parallel & 2 serial ports, 80-key keyboard, MS-DOS 4.01, video drivers, LIM EMS 4.0 EMM4, leather and nylon carry bag, User Manual and Pocket Guide, 6.6 lbs with battery, 1 8 1/2" x 11" (DxHxW), full 1 year warranty. Options: extra battery packs, external 5.25" floppy drive, packet LAN adapter, packet modem, MS Windows 3.0. Prices and specifications are subject to change without notice. All product and company names are trademarks or registered trademarks of their respective holders. Twinhead, Supernote, and SmartCharge are trademarks of Twinhead Corporation. © 1991 Twinhead Corporation.

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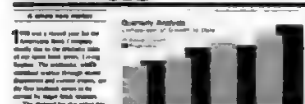
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only get your output faster, you get your screen back faster. The LaserJet IIIP also has a new 16 MHz processor and PCL5 for on-the-fly typeface scaling and fast vector graphics. These advancements mean this compact printer

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IDEALOCUS



1990 was a record year for the HP LaserJet IIIP printer. The chart shows that the HP LaserJet IIIP printer was the most popular laser printer in the U.S. in 1990, with over 150,000 units sold. This success was due to the printer's affordability, high print quality, and fast throughput. The chart also shows that the HP LaserJet IIIP printer was popular in other countries, with sales reaching over 10,000 units in each of the other five countries shown.

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after you price the memory upgrades. The T2000SX may be one of the best notebook computers you can buy, but it could be better still.

In day-to-day operation, the Toshiba performs on par with what you'd expect from an entry-level SX-class computer—delightful if you've been running a 286 laptop PC before, just a heartbeat too slow if you're used to a leading edge 80386-based desktop PC. This is the class of machine you'd find acceptable as your only computer when you add a color monitor and possibly a network connection for off-line storage of files. Like many of the notebooks in this roundup, the T2000SX offers 20- and 40MB drives, but even the larger 23-millisecond Conner drive feels a bit confining if you're used to a 100MB desktop PC's hard disk. If you've ever moved from a big house in the suburbs to a studio apartment, you know the feeling.

NO WIMP

Other Toshibas have been wimps in the battery-life department, but not the T2000SX, which ran 3 hours 8 minutes on PC Magazine Labs' standardized tests. That's the best of any notebook tested here. And in the real world, you can run 4 hours by scaling back from 16 to 8 MHz,



invoking disk power-down, and choosing software that does not go to the hard disk every few minutes for overlays (*Lotus 1-2-3* is exemplary). Give credit also to the CPU sleep mode; the processor backs down to 2 MHz when there's no CPU activity. Press the Fn and Esc keys and you can pop up a battery-charge indicator, or toggle the half-dozen power-conservation parameters. Very nice. Once the battery does wear down, complete recharge takes only 90 minutes. Auto-resume, a standard on most Toshiba laptops, lets you press one button, walk away for sev-

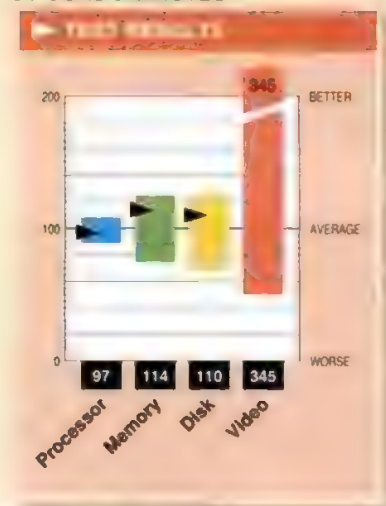
eral days (at least four, Toshiba says), return, and be up and running where you left off under DOS or *Windows*—in 5 seconds. Auto-resume makes the T2000SX a great notetaker as you pop from meeting to meeting or client to client because you avoid the lag of a minute or so during which conventional laptops boot up and load software.

But mostly the T2000SX runs so long because the battery is so big—1.5 pounds, second only to Compaq's 1.7-pounder. Toshiba claims that nickel hydride is 20 percent more powerful than nickel cadmium today on a pound-for-pound basis and has the potential to be 50 percent better. But PC Labs found no evidence to support that on our test unit. In fact, among the 14 16-MHz laptops, it ranked seventh on weight-adjusted battery efficiency.

The 5- by 7-inch Toshiba-built VGA LCD display (16 gray shades) is solid, neither dazzling nor faint. One gripe: In VGA text mode, the display scans only 400 lines, not 480, squashing the display by a half-inch top and bottom. You can

Toshiba T2000SX

**BATTERY RUNDOWN TEST SCORE:
3 HOURS 8 MINUTES**



In Short: An excellent keyboard and super-handly auto-resume feature make this 16-MHz notebook desirable. Thanks to its quick-charge nickel hydride battery, the Toshiba T2000SX has the best battery life of any laptop reviewed (3 hours 8 minutes). At 6.9 pounds and 1.9 by 12.2 by 10 inches, it's small for a portable, a bit big for a notebook, and, at \$4,748, priced higher than average (even after a potential dealer discount). Be sure to invest \$449 in the error-correcting modem. Memory upgrades run about \$500 per MB.



Nobody beats the Toshiba T2000SX's nickel hydride battery life and auto-resume feature.

PC FACT FILE
EDITORS' CHOICE

T2000SX

Toshiba America Information Systems Inc.,
9740 Irvine Blvd., Irvine, CA 92718; 714-583-
3000.

List Price: \$5,197.

Tested Configuration: 3MB RAM, 40MB
Conner hard disk, DOS 4.01, 2,400-bps
modem with MNP 5 data compression and
V.42bis error control.

Options: 1MB, \$549; 2MB, \$999; 4MB,
\$2,199; 40MB hard disk, \$5,499. External
floppy disk drive, \$499; 2,400-bps modem,
\$349; with V.42bis and MNP5, \$449; extra
battery, \$229; AC power adapter, \$169; car
battery adapter, \$159; expansion chassis,
\$1,199; numeric keypad, \$99; carrying case,
\$99; leather carrying case, \$129.

CIRCLE 605 ON READER SERVICE CARD

cure that with Personics' Laptop Ultra-Vision screen enhancer, which takes up 16K of memory. The T2000SX comes with 1MB RAM. You can add more with a slide-in RAM card of 1-, 2-, 4- or 8MB—but only one card at a time, and you pay a frightful price for convenience: \$999 for the 2MB card, \$2,199 for 4MB (even after substantial price reductions Toshiba didn't change these figures). Be sure to get the T2000SX with the modem that has V.42bis error control and MNP5 data compression. At \$449 list, it's only \$100 more than the plain vanilla 2,400-bps modem. One caveat: The 1.44MB floppy disk drive and the modem jack are on the right side; they'll be inaccessible if you clip on Microsoft's new BallPoint portable track ball on the right side.

QUALITY DOESN'T COME CHEAP

Till recently, Toshiba's notebook PC competed at the upper end of the price spectrum with Compaq and IBM. Toshiba has a better screen and smaller footprint than IBM, better cursor keys than Compaq. But the other two offer 60MB drives. After a recent 32 percent price cut, however, this system is more competitive: \$3,399 for Toshiba's basic configuration (1MB RAM and a 40MB hard disk) and \$5,197 list with 3MB RAM, the 40MB hard disk, and the V.42bis-equipped modem. Knock off 25 percent for dealer discounts and you're at about \$3,800, comparable with Dell, AST, and others in this general size/weight/performance area. If you don't mind being on the wrong side of average on heft, you'll love being at the head of the class on usability and battery life with the T2000SX.

COVER STORY
386SX NOTEBOOKS

TWINHEAD
Supernote 386SX

by Bruce Brown

Hard disk storage space is a big deal for some people, even while they're on the road. Twinhead's 16-MHz Supernote 386SX isn't a perfect notebook in all respects, since it's missing internal modem capability and has a nonstandard cursor-key layout. But the Supernote 386SX is also the only notebook in this crop that has room for two 2.5-inch internal 60MB hard disks, and that makes this system worthy of serious consideration by the user with heavy-duty storage needs.

Twinhead sells a standard configuration system with 2MB RAM and a 3.5-inch 40MB hard disk for \$3,495. After a typical 25 percent discount, you'll probably pay just under \$3,000 on the street. We tested the 40MB system on the PC Magazine Labs benchmark tests for this review but also worked with the 120MB dual hard disk system. With both 60MB drives installed, the Supernote 386SX lists for a lofty \$5,297, with a probable street price a bit over \$4,000. This may seem like a lot to pay for a mail-order notebook com-

PC FACT FILE

Twinhead Supernote 386SX

Twinhead Corp., 1537 Centre Pointe Dr.,
Milpitas, CA 95035; 800-545-8948; fax: 408-
945-1080.

List Price: \$3,495.

Tested Configuration: 2MB RAM, 40MB
Conner hard disk, 1.44MB floppy disk drive,
VGA LCD, DOS 4.01, AC power adapter,
carrying case.

Options: 2MB RAM upgrade, \$249; upgrade
to 60MB hard disk, \$699. External floppy disk
drive, \$299. 2,400/9600-bps modem with
send-only fax, \$249. Extra battery, \$99; car
battery adapter, \$249; network adapter, \$599;
numeric keypad, \$99.

CIRCLE 606 ON READER SERVICE CARD

puter, but if drive capacity is what you need price may not be the most important factor in your decision.

Our 40MB test system weighs 6.7 pounds with battery (with the two smaller 60MB drives it's actually slightly less, at 6.6 pounds) and measures 2 by 11 by 8.5 inches. The AC adapter measures 1.8 by 6.5 by 3 inches and weighs 1.5 pounds. A spare battery, available for \$99, weighs 1.3 pounds and, with the standard nylon case, a complete system to carry around would weigh in at just over 10 pounds.

The 5- by 7-inch backlit supertwist



The Twinhead Supernote 386SX has no room for an internal modem but plenty of disk space for files.

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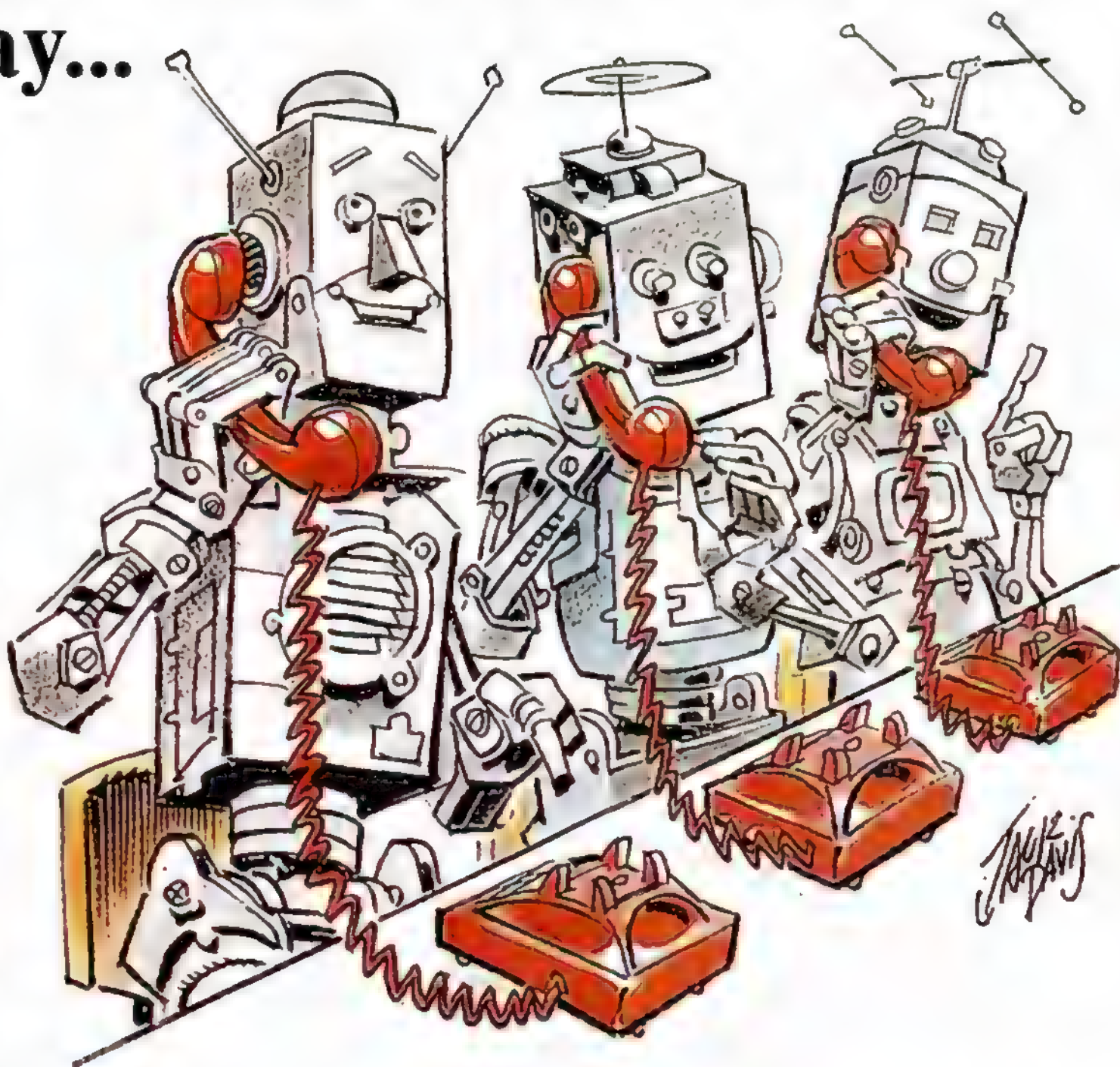
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LCD is run by a Cirrus Logic VGA chip set that produces up to 32 gray shades at its 640-by-480-pixel maximum. *Windows* looks fine on this display, though monochrome *Windows* is less than fantastic on any system.

The Twinhead keyboard is quiet, but there are no unshifted page movement keys, and the cursor keypad uses the nonstandard inverted-L design rather than a T. This setup takes some getting used to. One interesting touch is pairs of Ctrl and Alt keys on either side of the Spacebar.

The Twinhead's battery slides out easily, making battery switching a snap. But battery life on PC Labs' Battery Rundown test was a disappointing 1 hour 50 minutes. The power-saving features, accessible via setup, are not *Windows* 3.0-aware. A sleep mode, accessed via a stand-by key, is claimed to keep the system RAM contents alive for more than 8 hours but won't work with *Windows*, either.

You can't add memory to the Twinhead system yourself. The standard 2MB can be increased to the maximum 4MB

only at the factory, preferably at time of purchase. Since the extra 2MB RAM costs only \$249, it's a good idea to get the whole amount ahead of time unless you're sure you won't need it. Another shortcoming: the Supernote has no provision for an internal modem.

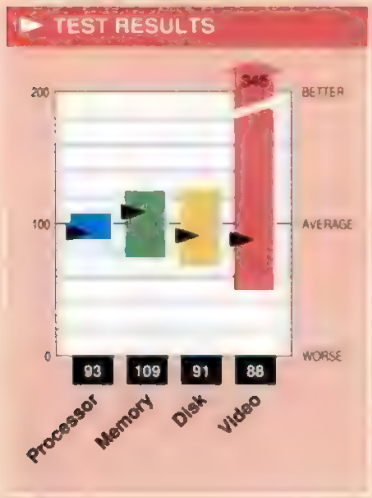
Twinhead gives a one-year parts-and-labor warranty on the system. Dealers

maintain authorized service centers, or return the unit to the factory for service; tech support is toll-free.

More battery life and *Windows*-compatible battery-conservation features would make this system a better choice, to say nothing of user-accessible memory upgrades, provision for an internal modem, and a better keyboard layout. But if you need lots of storage space, a potential 120MB of program and data files in a sub-

Twinhead Supernote 386SX

BATTERY RUNDOWN TEST SCORE:
1 HOUR 50 MINUTES



In Short: This 7-pound, 16-MHz, 2- by 11- by 8.5-inch notebook can sock away two 60MB hard disks—twice the storage potential of any other notebook. But you must *want* storage: The Supernote's battery conservation can't handle *Windows*; its keyboard uses the nonstandard L-shaped layout; and there's no room for an internal modem. Nevertheless, a loaded system carries scads of files around.

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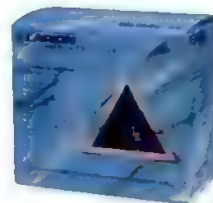
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The problem with the Veridata Execulite's clip-in modem, mouse, and RS-232 modules is that you can use only one at a time.

sits under a snap-off door at the back. The Execulite's battery weighs only 11 ounces (about two-thirds the average battery weight for this review group), which makes carrying around a \$75 extra a little friendlier. The battery lasted 2 hours 8 minutes on PC Magazine Labs' Battery Rundown test, which is the highest juice-to-weight ratio in our group. But remember that this unit has only one memory module and has a screen that is dimmer than those of some other notebooks, a combination that results in less power consumption and longer battery life.

The Veridata Execulite's clip-in modules are held in place by a thumbscrew and snap right into a gap on the left side of the chassis, just above the keyboard. The computer comes with a standard module that gives you a PS/2 mouse or keyboard connector and an external video connector. But you can also get an extra RS-232 connector (\$35), a 2,400-bps modem (\$180), or a mousepad (\$100). Two other modules will soon be available: a 2,400-bps modem with MNP 5 and a fax/modem.

The problem with the modules is that you can use only one at a time. You can't have the modem connected and use a mouse—more or less ruling out the use, say, of a *Windows 3.0*-based communications program like *Crosstalk*. Since the computer doesn't have an expansion chassis, this may frustrate power users.

SIZE ISN'T EVERYTHING

Although the Execulite is smaller than most notebooks, the screen and keyboard size aren't adversely affected. The screen is Sharp's standard-size 5- by 7-inch triple supertwist LCD display, which in other machines produces a crisp image with good brightness and contrast. We found



Execulite 386S

Veridata Research Inc., 11901 Goldring Rd., Suite A&B, Arcadia, CA 91006; 818-303-0613; fax: 818-303-0626.

List Price: \$4,585.

Tested Configuration: 4MB RAM, 30MB Conner hard disk, 1.44MB floppy disk drive, VGA LCD, DR DOS 5.0, AC power adapter, external floppy disk drive, external CRT adapter.

Options: 3MB RAM upgrade, \$480; upgrade to 60MB hard disk, \$640; 2,400-bps modem, \$180; with send-only fax, \$220. Extra battery, \$75; carrying case, \$55.

CIRCLE 607 ON READER SERVICE CARD

Veridata's implementation a bit dim—a factor that contributed measurably to its excellent battery life.

The keyboard is full size but has only 79 keys. And for some keys, such as F11 or F12 and PgUp or End, you have to press a special function key. The Veridata does have the now-standard inverted-T cursor keys, but only those four are dedicated. You'll have to use the Fn key in combination with the cursor keys to get at Home, PgUp, PgDn, and End.

The Execulite has several power-saving features. You can blank the screen or power down the hard disk at intervals from 1 to 15 minutes. This can be accomplished at system setup time or with a built-in utility that operates as a TSR. This utility is not *Windows 3.0*-compatible. If you're using *Windows*, you won't be able to get the display back after it blanks. The computer will also automatically drop down to 10-MHz if an application isn't active and the keyboard is idle.

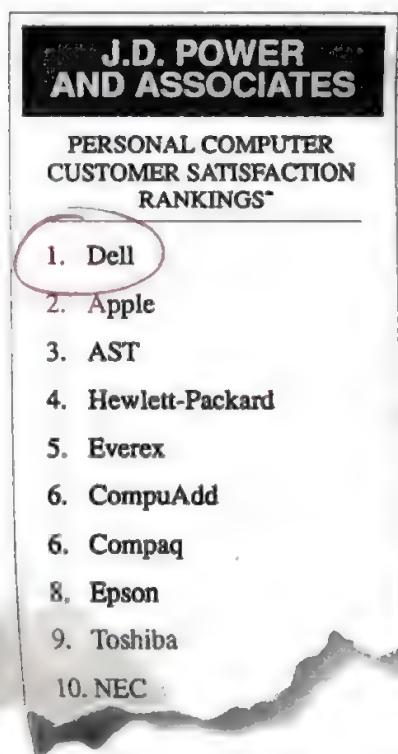
Veridata's service and support for the Execulite includes a one-year warranty on parts and labor. The user pays shipping one way to the manufacturer for repairs. Veridata offers no on-site service, and toll-call support from 8:30 A.M. to 5:00 P.M., P.S.T., Monday through Friday. The company does guarantee repair turnaround in five business days.

For those who need the lightest of the bunch, the Execulite makes a reasonable—if pricey—choice. Although its external floppy disk drive is included in the unit's price, you may find the lack of an internal floppy a limitation on trips away from AC power. Couple that with a rather dim screen, slow hard disk access, and only four dedicated cursor keys, and you'll need to think twice about the Veridata Execulite.

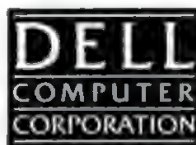


The Veridata Execulite 386S weighs in at 4.6 pounds but lacks an internal floppy disk drive and a bright display.

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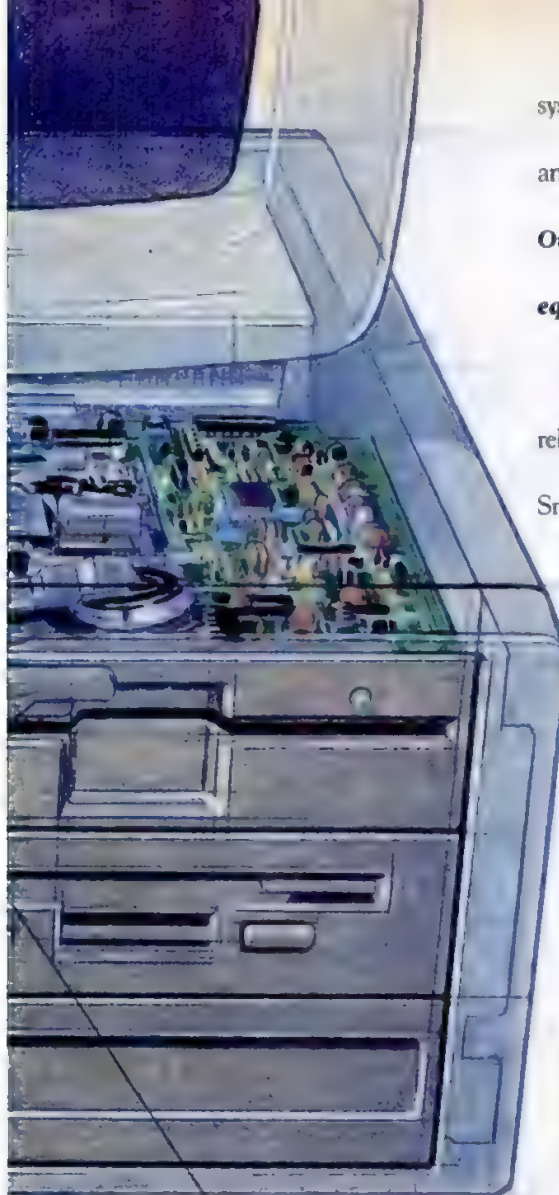
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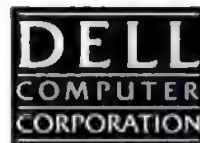
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less than many i486 systems, may make those others a little hard to stomach.

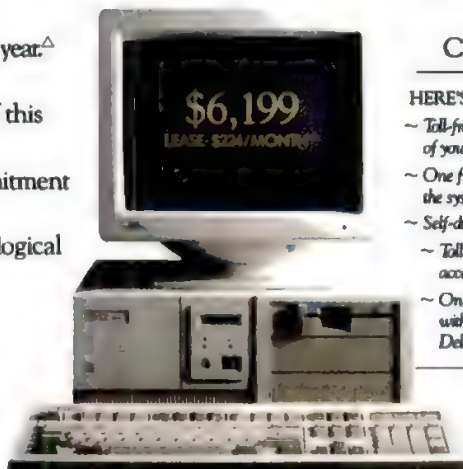
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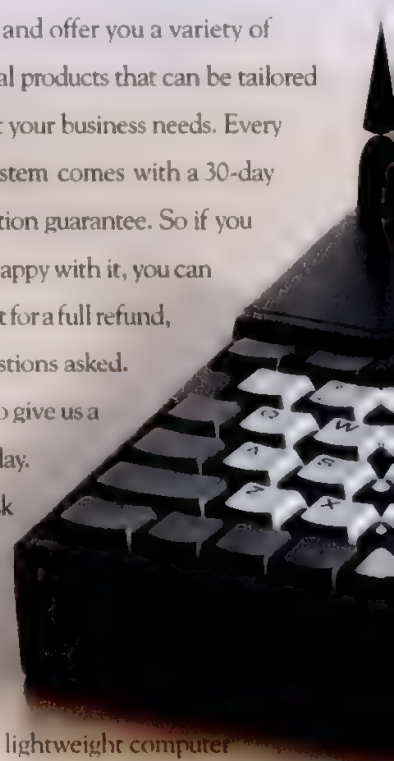
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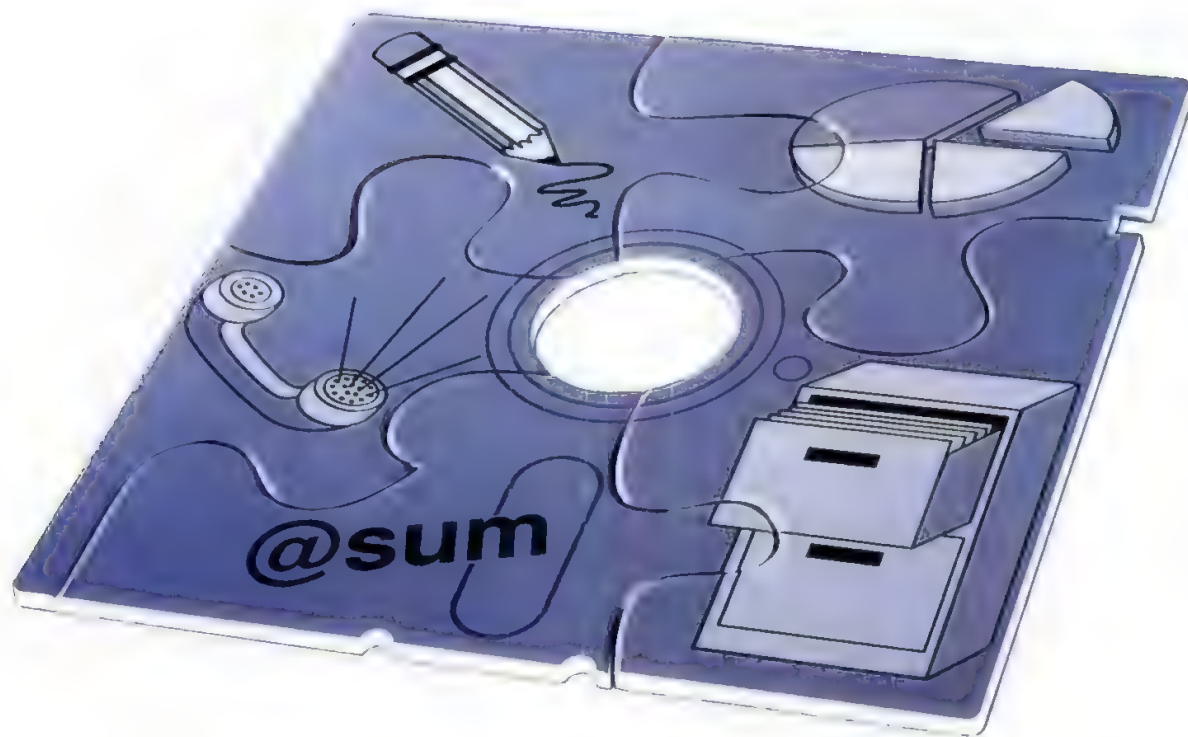
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Integrated Software Under \$200

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Word processing, database,
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nine bargain packages, including
Enable/BP, *Framework XE*,
LotusWorks, *Microsoft Works*, and
PFS:First Choice.

by Ed Perratore

If you buy Microsoft's *Word for Windows* and *Excel* for about \$300 each and pay another \$100 for *Microsoft Windows 3.0*, you've got a powerful software combination with a consistent interface and strong data-sharing capabilities. You're also paying for advanced features you know you'll never use, in addition to needing at least a 386-based PC and 2MB RAM to take full advantage of multitasking under *Windows*.

You have a better choice: an integrated software package that combines a word processor,

SOFTWARE INTEGRATED SOFTWARE

spreadsheet, and database into one coherent system that's easy to learn and use and lets you share data among applications. You'll have to compromise on some of the advanced features, but you can often run it in 512K, pack it on one floppy disk to take with you on the road, and, best of all, purchase it for a street price under \$100.

More and more users are finding this second option irresistible, and their ranks are growing to include small businesses, traveling businesspeople, and students. And software vendors are paying attention to users who are satisfied with less power for less money or who want to extend their business day on a less powerful home system. We evaluated nine

integrated packages, including some inspired newcomers, that list under \$200.

MORE CHOICES, BETTER CHOICES

International Data Corp. reports a healthy increase in unit sales for the under-\$200 integrated software market. At the same time, market share of integrated packages at the high end—listing close to \$700—has crumbled. (See the sidebar "Low-End Integrated Software's High Profile.") Enable Software and Ashton-Tate, two sellers of high-end integrated packages, have thrown down the gauntlet to Microsoft, and Lotus has joined with its purchase last spring of *AlphaWorks*, the vastly

evolved direct descendant of Alpha Software's *Electric Desk* (the first low-end integrated package for the PC).

The most recent shuffling of forces concerns Software Publishing Corp.'s sale of its low-end product line to Spinnaker Software, manufacturer of *Eight-in-One*. By selling the *PFS* line, Software Publishing turns its focus to the corporate market. As new parent to *PFS:First Choice*, *PFS:First Publisher*, and *PFS:Preface*, Spinnaker emerges as a leading software supplier to the home and small-business market—a position it hopes to boost further with its new low-end *Windows* package, *PFS:WindowWorks*. (See the sidebar "Spinnaker Sails into Windows.")

Ashton-Tate, the vendor of *dBASE IV*, and Lotus Development are also courting the low-end integrated market. In October 1990, Ashton-Tate introduced *Framework XE* for \$149, an integrated choice that contains much of the functionality found in the \$695 *Framework III*. Alpha Software's *AlphaWorks*, selected as an Editors' Choice in our last evaluation ("Integrated Software Gets It Together," *PC Magazine*, December 26, 1989), is now a Lotus product and has been renamed *LotusWorks*. The box is different, but the insides remain unchanged.

In the midst of these shifts, *Microsoft Works*—selected as an Editors' Choice in our last evaluation—still dominates the low-end market. Rather than updating this favorite, Microsoft has devoted development resources to the completion of its long-awaited *Microsoft Works for Windows*, reportedly due by the end of the year. The delays have opened a window of opportunity for other vendors.

REVIEW CRITERIA

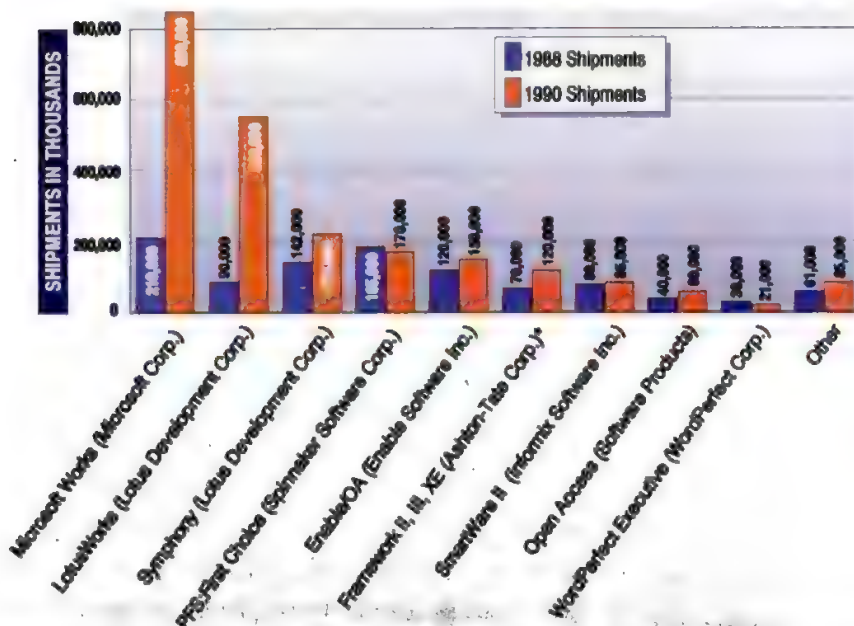
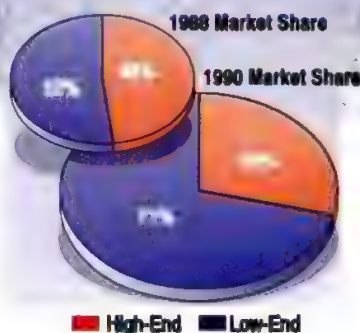
It isn't easy to pin down the notion of "integrated software." At one extreme, integrated software encompasses desktop utilities like Borland's \$99 *SideKick* and Lotus's \$85 *Metro*. These packages can run as TSRs (terminate-and-stay-resident programs) and include notepads, address books, time planners, calendars, and dialers for all-in-one solutions to the daily overload of information. They can be capable assistants without replacing your standalone applications.

At the other extreme are high-end integrated packages like Lotus's *Symphony*, Ashton-Tate's *Framework III*, Enable Software's *Enable/OA*, Software Products' *Open Access III*, and Informix Software's *SmartWare II*. These programs

LOW-END INTEGRATED SOFTWARE'S HIGH PROFILE

As these shipment figures indicate, annual sales of the entire integrated software market have more than doubled since 1988, with *Microsoft Works* consistently leading the way. Over the same period, the market share of low-end (under \$200) packages has increased while the market for high-end packages such as *Symphony*, *Enable/OA*, and *Framework II and III* has eroded.

INTEGRATED SOFTWARE



Source: International Data Corp.

*Framework XE included only in 1990 data.

chiefly address the corporate market and list for \$695 or more.

To be included in this evaluation, the packages had to list for less than \$200, offer modules for word processing, spreadsheets, and database management, and employ some level of integration among the applications. The packages reviewed—Tandy Corp.'s *DeskMate*, Spinnaker Software Corp.'s *Eight-in-One*, Enable Software's *Enable/BP*, Ashton-Tate Corp.'s *Framework XE*, Lotus Development's *LotusWorks*, Microsoft Corp.'s *Microsoft Works*, Top Ten Software's *Personal Office*, Spinnaker Software Corp.'s *PFS:First Choice*, and Star Software Systems' *Venture*—also include communications and graphics modules as well as desktop utilities (except in the case of *Venture*).

Two notable packages did not meet all our criteria, since they combine only two of the three required modules and are priced over \$200. Symantec's \$349 *Q&A* is positioned more as a database with a bundled word processor than as an integrated package. WordPerfect Corp.'s \$249 *WordPerfect Executive* combines a word processor scaled down from the company's flagship *WordPerfect*, a spreadsheet modeled after *PlanPerfect*, and some database functionality, with utilities like a calculator, appointment calendar, and phone list. (For evaluations of these products, see "Q&A: The Answer for Many" and "WordPerfect on the Fly," *PC Magazine*, December 26, 1989.)

Mosaic Software's *Integrated 7 Advanced* and ShareData's *PRO Staff* (both reviewed in our last roundup) and Software Trust's *Easy Office Pack* fit our review criteria, but their vendors declined to participate.

MORE FOR YOUR MONEY

Today there is much more to the low-end integrated software on the market than several applications and utilities slapped together with a low-end price. These packages compete not only in the quantity of functions they provide but also in the level of integration they achieve. A vendor must be prepared to offer more than mail-merge and labelmaking facilities for its product to stand out.

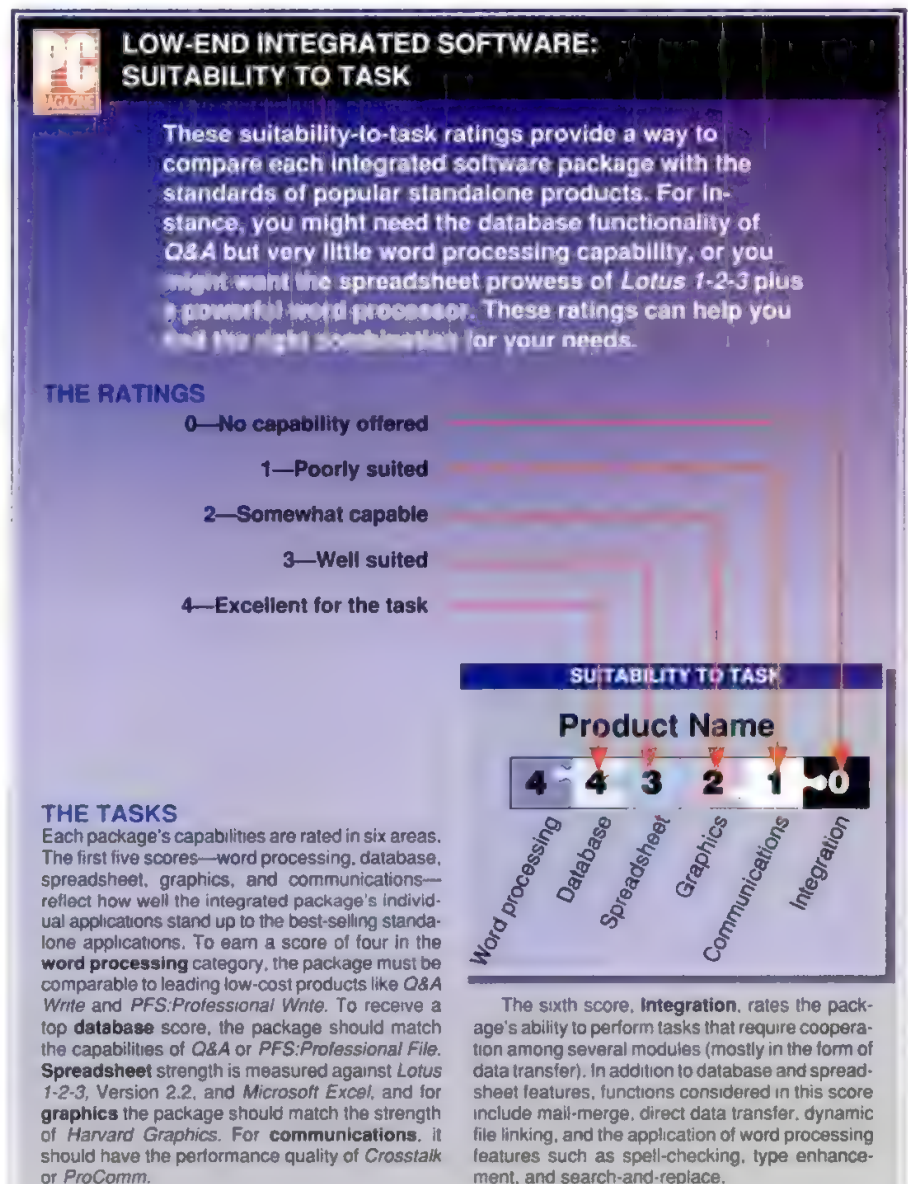
Each package reviewed here reveals weaknesses as well as strengths; after all, this is a low-end category. At the very low end of the spectrum are the under-\$100 packages, which compromise functionality but are more than suitable for

some entry-level users. *Personal Office* provides little data transfer among modules, and both *DeskMate* and *PFS:First Choice* rely on a clipboard for data exchange. And *Eight-in-One*, for all its handy features, makes you export data from one application, call up another, and import the data back into the program.

Microsoft Works and *LotusWorks* allow plenty of versatility when it comes to sharing data among modules but don't fully match the flexibility of *Framework XE*, which accommodates any combination of formats into one "containment frame" that you can save and retrieve as an individual file. This file conveniently

retains hot links among graphics, spreadsheet, and database files in the process.

In addition to data-sharing functions, all but *Enable/BP* maintain a consistent interface across all applications. Users with expanded memory can build large files with programs such as *LotusWorks*, *Microsoft Works*, and *Framework XE*. With *Enable/BP*, one spreadsheet function will highlight all cells related to the one you've specified (via formulas), and the word processor lets you mark non-contiguous blocks of text for moving or copying. While font capability remains weak across the board, these programs allow you to use some selection of printer-resident, cartridge, and downloadable fonts.



Despite the advances made since *Electric Desk*'s 1984 debut, power users remain skeptical—and so they should. Only standalone products can fully address the needs of spreadsheet, word processing, or database power users. So who buys low-end integrated software these days?

The "something-for-everybody" approach initially promoted by vendors has long been abandoned in the search for and discovery of a more rewarding market. That market now includes the laptop user, who is able to pack some all-in-one programs onto a single 1.44MB 3.5-inch floppy disk. Educators and their students, home users (who need a program that can accept common file formats), and especially the burgeoning crowd of home-based, small-business users are all targeted consumers.

Home users, in particular, are the recent target of plenty of marketing dollars in the form of retail-store specials like the IBM PS/2 and the Tandy 1000 RL (see the sidebar "The Integration of Integrated Software"). New users expect ready-to-run software with their ready-to-run PCs, and companies like Microsoft and Lotus expect to win these buyers and keep them in hand along their upgrade path, all the way to the horizon.

HOW WE TESTED

When shopping for a low-end integrated program, you should judge features more than performance. To examine functionality, we ran tests that determine how well each program's individual applications work together to produce a document containing text, merged database information, and spreadsheet data in tabular and graphed formats.

From a comma-delimited file of database records of airline flight information, we created a database within each program and imported the ASCII file. Two programs, *DeskMate* and *Personal Office*, required manual input since their database modules do not import data. *DeskMate* allows mail-merge solely from the separate address book, which we used for testing instead of the database module. We then performed sort, query, report, and output tests, and evaluated innovative features along the way.

Another file, a .WK1 spreadsheet, comprised a set of company sales figures for four products over three months' time. We imported and copied this spreadsheet into a text document and also graphed the data to see whether the graph could be

brought into the document. In the word processing module, we built a document using imported ASCII text, formatted it using whatever features each program had to offer (such as right justification and auto-hyphenation), spell-checked it, and merged in several database records. Before bringing in the spreadsheet and graph, we sent out a copy using the communications module.

For a complete overview of the functions each program offers, see the features table and the Suitability to Task scores, which rate each product on word

processing, database, spreadsheet, graphics, communications, and integration.

PROMISES, PROMISES

It may seem that the popularity of *Windows* and graphical user interfaces will eventually spell doom for integrated software. With the *Windows* Clipboard and dynamic data exchange (DDE), might not a few midrange applications running under *Windows* provide the same functionality?

If there is a threat, it is the more costly high-end market that is targeted. Conceivably, DDE and the *Windows* Clipboard might someday work as efficiently as *Framework XE*'s compound docu-



EDITORS' CHOICE

- *Framework XE*
- *Microsoft Works*

When you judge integrated software programs under \$200, three pivotal criteria emerge: the presence of a complete and well-balanced feature mix, the speed with which you access the integrated components (the ease-of-use factor), and how well the program's disparate pieces maintain a consistent interface and cooperate in the sharing of data across modules.

Framework XE satisfies all three criteria with aplomb. While you should approach the first version of any program with caution, *Framework XE* is hardly new. In fact, there isn't much in the high-end *Framework III* that you won't find in this \$149 package. There's a Quick-Start module and extensive on-line help to ease new users into the program's way of operation. From the consistent, menu-driven interface, you can access the most complete word processor, database, and spreadsheet (although not the largest worksheet) among the packages evaluated here. This is supplemented by an outliner and communications capabilities that include use of the MHS protocol.

With EMS support, there's no practical limit to the number of windows you can work with at one time, and advanced users can extend the program's functionality with the FRED programming language. If you want to take your work to a more-

powerful standalone application, there are generous import/export capabilities for all major file formats.

Our other Editors' Choice is the best-selling *Microsoft Works* (\$149), a long-time favorite for its outstanding word processor and on-line tutorial. Even though the latest version shipped in late 1989, and Ashton-Tate and Enable Software have had a chance to improve the standards of excellence in this category, *Works* remains a strong contender. While the program is starting to show its age (we eagerly await Microsoft's next inevitable upgrade), it still outshines most other packages.

LotusWorks (\$149) and *Enable/BP* (\$199) are both respectable runners-up. We selected the former as an Editors' Choice in our last roundup of low-end integrated software when it was still called *AlphaWorks*. An upcoming revamped version is expected to have a smoother, Lotus-quality interface.

If not for its formidable learning curve and inconsistent interface across modules, *Enable/BP*, another small-scale version of a high-end integrated package, would be a stronger Editors' Choice contender. The next version needs to give users the ease and consistency they demand. Then its functionality and versatility will shine through.



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Jim Seymour

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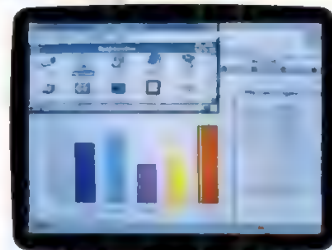
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ments. And the collective applications of *GeoWorks Ensemble* could someday become an integrated solution for the home/small-business user who wants a graphical interface and multitasking abilities to run on an XT with 512K RAM. Once a spreadsheet (expected in *Ensemble*, Version 2.0) and other applications written for the PC/GEOS environment are developed, its prospects for emerging as a *Windows* alternative are even greater.

For now, the low end of the integrated software market is unbeatable. Any *Windows*- or other GUI-based standalone applications would be hard pressed to sell collectively for less than \$200. That leaves the low end of the market increasingly protected, powerful, and promising. The following evaluations have more to offer now than ever, whether you work from home or from the road. And if you make sure that the package you're considering has the features you need now, as well as the file compatibility for later upgrades, you can't lose.

DeskMate

Tandy Corp.'s *DeskMate* is a \$99.95 integrated package geared mainly toward the new user. *DeskMate* is also an operating environment that provides an upgrade path into a family of more than 20 third-party applications. This compatibility gives you the flexibility to share *DeskMate* word processing files with Symantec's *Q&A Write* or to share spreadsheet files with *Lotus Spreadsheet*, the *DeskMate* version of *Lotus 1-2-3*. Without this unique upgrade route to software that supports the *DeskMate* operating environment, the package would be just as dead-end as *Personal Office*.

DeskMate has a *Microsoft Windows*-like interface that you access with a mouse by clicking into modules, files, and menu options. The package comprises word processor, spreadsheet, database, paint, and communications modules, including access to the *PC-Link* on-line service, plus a collection of helpful desktop utilities. One feature, the address book, uses its own records—not those contained in the database—for mail-merge procedures. *DeskMate* also includes an electronic Hangman game for the quiet moments. (For an evaluation of the *DeskMate* version bundled with the Tandy 1000RL, see *After Hours*, January 15, 1991.) *Desk-*

SOFTWARE INTEGRATED SOFTWARE



FACT FILE

DeskMate, Version 03.05.00

Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

List Price: \$99.95.

Requires: 640K RAM (512K for Tandy ROM-based PC), graphics adapter, DOS 3.0 or later. Mouse and hard disk recommended.

In Short: Ease of use and upgradability to the *DeskMate*-environment product line make this *DeskMate* version worth considering for the home or casual user. However, compromises throughout the product, particularly in the database, weaken its merits for small-business use.



CIRCLE 400 ON READER SERVICE CARD

Mate's installation procedure automatically modifies your AUTOEXEC.BAT path and reboots your PC, but you can edit the .BAK file created during installation.

Among *DeskMate*'s strengths is its task-switching function, which lets you flip between any two files and readily exchange data. File-handling commands include Run (that starts applications and other programs), Disk Copy, and Make, Change, and Remove Directory commands. *DeskMate*'s clipboard can hold any number of files for use as needed.

ADD-INS BOOST FEATURES

DeskMate's word processor, like the other modules, offers a limited set of features

that you can augment through companion products. These products usually sell for \$19.95 and provide capability for macros, thesaurus, outlining, and other functions.

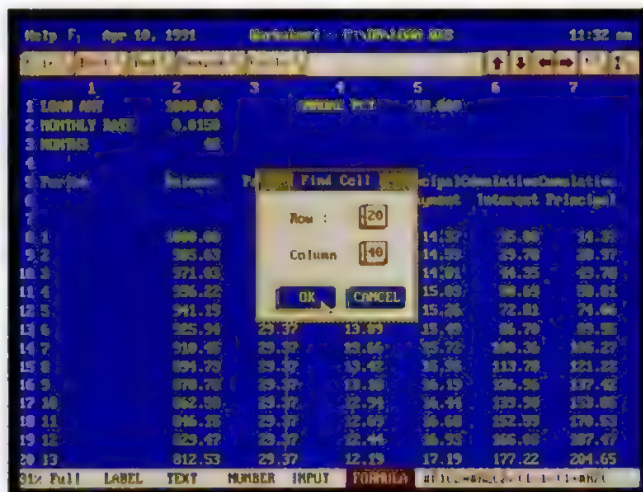
Import/export is through ASCII only and is limited to a maximum file size of 50K—the smallest of the products reviewed. Enhanced text is displayed in WYSIWYG format, and graphics transferred in can be displayed or hidden. Font support is limited by the program's printer driver selection (37 printers and their compatible equivalents). Italics and doubled-up attributes such as bold underline are not supported.

You can block text in chunks of 16K, which you can then copy or move to the clipboard, delete, format, or print. From the clipboard, text can be saved as a file or inserted into another document. You can also transfer in spreadsheet data via ASCII export/import, but your ability to work with database records is more limited. The database module can export ASCII data but does not import ASCII data or accept data from *DeskMate*'s own word processor.

SIMPLE DATABASE FUNCTIONS

DeskMate's database module provides direct links to Form Setup and Filer facilities where you input, view, and format database records. With Form Setup, you can add graphics to records or dress up records with file-folder outlines from the paint module. If you don't need to calculate fields, merge databases, or generate reports, *DeskMate*'s database component may serve you well.

The maximum size of data files you can create is 675K, enough for a small database without too many records. A



The numbering of columns and rows in *DeskMate*'s spreadsheet module can be confusing, but the Find Cell option under Search helps by requiring separate input. The template file displayed here calculates loan amortization.

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SPINNAKER SAILS INTO WINDOWS

by Ed Perratore

It makes sense that an integrated package would eventually run under *Microsoft Windows* and take advantage of its common user interface and easy applications switching. In May, Spinnaker Software Corp. became the first developer to debut a *Microsoft Windows*-based integrated package, *PFS:WindowWorks*. For \$199, it combines a word processor, spreadsheet, database, graphics, communications, label-maker, and address book plus the advantages of *Windows*' desktop utilities, multitasking ability, and graphical interface.

The beta version that *PC Magazine* previewed displayed superior integration among modules and seamless transfers—block, click, and copy—for all types of data files. Spinnaker, which designed the package from the ground up, is not out to claim a prize for a laundry-list comparison of features. Instead, it aimed *PFS:WindowWorks* to be the best of the bunch by building the most useful features into the most accessible design.

SUPERIOR INTEGRATION,
EASY ACCESS

Spinnaker has devoted the most attention to the word processing module, where you can open four files at once and readily transfer in a spreadsheet, graphics image, or database record. Although dynamic data exchange (DDE) has not been implemented, you can auto-refresh all data you paste into a document with hotlinks to its source. If you block a section of a spreadsheet, drag your mouse to a word processing window, click to paste, and select auto-refresh from a pop-up window, you've successfully transferred data and made your hotlink.

PFS:WindowWorks surpasses all the other packages by providing additional scalable fonts—supplied by Atech Software's *Publisher's PowerPak*—in addition to the usual *Windows* fonts. And the *Windows* graphical interface lets you view and edit on-screen in true WYSIWYG mode, which is far more friendly than the uneditible print pre-

view mode other programs offer. Click-on options located along the top of the workspace include bold, underline, italic, and justify, and a variety of views for zooming in as much as 200 percent, which is particularly helpful if you're using the manual kern feature.

You can design multicolumn documents (also offered by *Enable/BP*), shade paragraphs, use graphics tools to draw lines and boxes, set the display for quick screen refresh while editing, and modify objects pasted into your document.

The database and address book offer smooth mail-merge facilities to the word processor and label maker and provide separate Copy and Copy Record commands to expedite data transfer. The database is unable to create table views and is restricted to wildcard searches on one-field and first-occurrence hunts. A welcome enhancement would be the ability to merge records that satisfy specific criteria or to search on all occurrences and merge records from a partial table.

Thanks to *Windows*' extended memory support, the spreadsheet workspace in *PFS:WindowWorks* allows up to 30,000 rows by 10,000 columns. Import and export to .WKS and .WK1 (except macros) take just a few mouse clicks, and you can select blocks for font application, graphing, border drawing and

shading, and row height. One lifesaver: an Undelete function that retrieves a deleted block. You won't find hidden columns (convenient even for new users), split windows, named ranges, cell protection, or spreadsheet merge, and the set of 42 spreadsheet functions is comparatively limited.

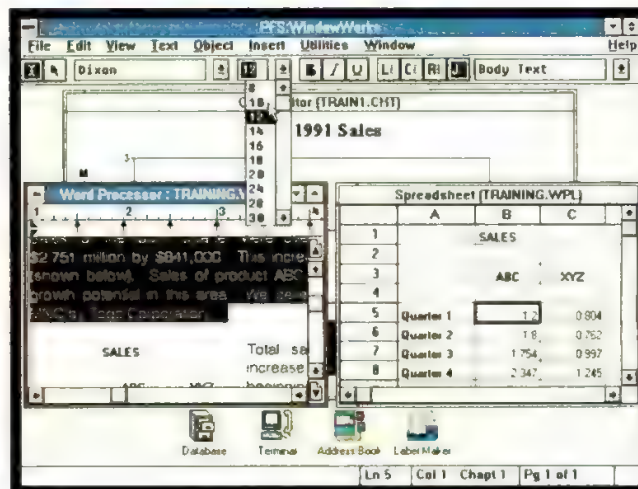
While *PFS:WindowWorks* does not have *Framework XE*'s robust import and export options and does not attempt to pack in spreadsheet or database dazzle, it is superior to every program we evaluated at the integration of data into one document. A question emerges, though: If you have *Windows* and a PC with the power necessary to run it, shouldn't you get the best standalone *Windows* applications and use them together in the task-switching environment? Not necessarily. After all, *PFS:WindowWorks* is truly integrated, and it makes good sense to use 90 percent of a less-expensive package rather than 20 percent of several expensive high-end standalone packages. ■

PFS:WindowWorks

Spinnaker Software Corp., 201 Broadway, Cambridge, MA 02139-1901; 800-826-0706, 617-494-1200.

List Price: \$199. Requires: 1MB RAM, graphics adapter, mouse, *Microsoft Windows* 3.0, DOS 3.1 or later.

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PFS: WindowWorks' word processing module, one of three resizable windows shown, allows on-the-fly font changes as well as click-on enhancements.



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On a normal day, Prime Time Shuttle makes 1,000 trips from four Los Angeles airports, one AMTRAK station, and the San Pablo Harbor, via LA's notorious freeway system, to homes and offices in four Southern California area counties.

At any given moment Prime Time Shuttle has 60 to 90 vans on the road. They track every flight so they know when each passenger arrives. They promise service within 15 minutes of the reservation or the ride is free, a promise they keep 97% of the time.

How do they do it? Back at headquarters, computers are taking reservations, verifying credit card charges, blocking reservations to assign to drivers, tracking the vans along the highways, recording the drivers' commissions as they are earned, and updating management with constant progress reports.

Kory Washburn is the assistant manager of Prime Time Shuttle who set up the computer system. He started December 23, 1990 with one dispatcher's computer. Now he's running 30 machines on a

LANtastic Ethernet system, and expects to add a new computer to the system every week until they reach 50 nodes.

He chose LANtastic because of the flexibility of its peer-to-peer structure. "Instead of a single overloaded server, we broke down the tasks, spread them over multiple servers and still fully interconnect the system with cheapernet cable."

Washburn praises Artisoft hardware and LANtastic software compatibility with other manufacturers' cards and systems. "You can't beat the price. And the speed is incredible, especially the way we abuse the system," he confessed.

"Artisoft tech support stuck with us until they solved our problems. They were great."

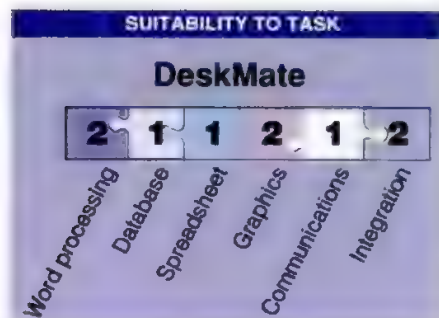
There's a myth that LANtastic is only suited to small, simple systems. But next time you need a ride from LAX, remember LANtastic is the Prime Time network.



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record can take up no more than one screen. Field types include text, numeral, and (using format characters) date and currency.

You can search for data that matches specified data, but matching records are displayed one at a time. Wildcards can be used, and database parameters allow searches for up to five fields. When generating mailing labels or form letters, you can merge in data only from the address book. This requirement severely limits the information you can merge into a letter to typical address-book data such as names and addresses.

PROPRIETARY SPREADSHEET FORMAT

DeskMate's spreadsheet size is the smallest of the programs reviewed, even with our formula-free test file. The size of the spreadsheet that we fit into RAM was much smaller than what the row/column limitations imply. For instance, you can scroll to the 99-row by 99-column limit, but you can't fill data into a spreadsheet of this size without running out of memory. *DeskMate* hit the limit at 33 rows by 75 columns, or 2,475 cells. Columns and rows are ordered by number, not by letter. A Cell Search command has you enter row and column into separate boxes to avoid confusion.

Although the spreadsheet uses a .WKS extension, it's a proprietary format that has no similarities to Lotus's .WKS extension. The spreadsheet exports only in ASCII format. In its favor, the spreadsheet does provide file merge, defined-range and landscape printing, and output to printer, screen, and file. There are only 16 functions—an adequate number for basic calculations, but skimpy in comparison with other packages.

To graph your spreadsheet data, you'll have to purchase the separate *DeskMate Business Graphs Companion* (\$24.95), which is the same graphing module in Star Software's *Venture*. Otherwise, the integrated paint module—including a

SOFTWARE INTEGRATED SOFTWARE

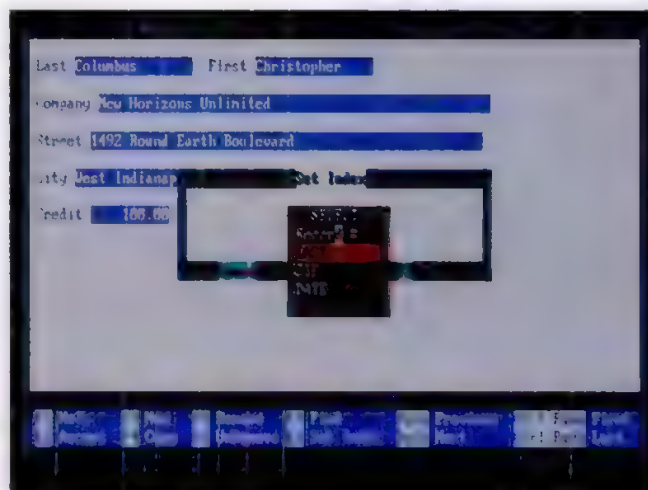
small collection of clip art and four scalable fonts—comes in handy for creating and editing bitmapped images. We used it to create a separate image that we transferred to the test document. (For all the other packages, we created a graph using spreadsheet data and imported the graph into the word processing document where possible.)

If you're planning to purchase an XT- or AT-compatible Tandy PC for home use and aren't yet sure how much capability you need, you can't lose by giving user-friendly *DeskMate* a try. If you need a more business-minded package, though, you can get a whole lot more for your \$99 elsewhere.

Eight-in-One

Fresh from a repackaging and renaming, Spinnaker Software's *Eight-in-One*, Version 2.0, has recently enjoyed some success, even without a significant update since its last release in the fall of 1989. At \$59.95, it's the least expensive package we tested, but it cuts corners. For a package this affordable, users will discover several features that make it nothing less than a bargain.

The eight functions in this package include a word processor, spell-checker/thesaurus, outliner, database, spreadsheet, graphics, communications, and an extensive set of desktop utilities that includes a world clock and individual label-maker. You can create multiple labels using the database.



Eight-in-One allows you to set up to three indexed fields in a database file. These are saved in an .NDX file that can be modified later, as shown here.

Eight-in-One, Version 2.0
 Spinnaker Software Corp., 201 Broadway, Cambridge, MA 02139-1901; 800-826-0706, 617-494-1200
List Price: \$59.95.
Requires: 512K RAM (640K recommended and required for DOS 4.0 or later), graphics adapter, DOS 2.1 or later.
In Short: *Eight-in-One*'s many powerful features are matched by as many shortcuts, but its low price and daring buy-back policy make it a bargain for home or small-business use. Upgradability is no problem if you outgrow the program.

CIRCLE 401 ON READER SERVICE CARD

MORE BRAINS THAN LOOKS

Eight-in-One is not a pretty program. It lacks the polish of *Microsoft Works* or Spinnaker's recently purchased *PFS:First Choice*. The documentation is comprehensive and well written, though its small type, poor graphics, and occasional use of light green italics make it difficult to read.

The program shows the first of its attractions once you're in the word processor. The top four lines of the work screen display the ruler line, typeface, format settings, and available RAM. Hitting Esc toggles the menu on and off, and you can use your mouse to select choices.

Eight-in-One's maximum document size is 150K, which is larger than that of *LotusWorks* and *PFS:First Choice*. Setting variable line spacing—in 0.05-pica

LOW-END INTEGRATED SOFTWARE: SUMMARY OF FEATURES

GENERAL FEATURES

Can fit on one 3.5-inch floppy disk for laptop use Many older laptop PCs without hard disks benefit from a program's ability to be installed on one floppy disk. A yes answer indicates that the complete or slightly scaled-down package installs on a single 3.5-inch floppy disk. *Microsoft Works*, for instance, installs without its thesaurus and on-line tutorial.

Can create shell for other applications A yes answer indicates that the package lets you launch into another program from its main menu, swapping itself out of memory until you exit the secondary application.

Network version available A package with a yes answer imposes no limits on the number of users that may run the program at one time. The network operating system, however, may impose its own restrictions.

Command strategies All packages reviewed use pull-down menus and, as an alternative, key combinations.

Maximum number of active windows indicates how many display regions can be opened and remain active in memory simultaneously.

Maximum number of displayable windows refers to the number of windows you can display at one time. *Framework XE*'s answer ("limited by disk space") actually involves a limit based on aesthetics and practicality—the number of windows you can display at once and use efficiently.

Maximum number of active applications indicates how many separate program modules can be opened simultaneously. Modules include word processing, database, spreadsheet, communications, e-mail (for *Framework XE*), and graphics.

Uses place markers while moving among applications Some programs let you keep the cursor in place within a file, even when you leave the file and return later.

File handling All of the packages provide some type of drop-to-DOS function. All packages offer a menu-driven method for deleting files, and each one can supply a directory of filenames.

Device support All of the packages support the common display adapters—CGA, EGA, VGA, and Hercules. All of the packages support a variety of dot matrix and laser printers.

Help All programs offer a manual-based tutorial for new users.

WORD PROCESSOR

Holds all pages in memory If the entire document is held in active RAM, it is limited to the amount of available memory. *Microsoft Works* spools excess pages to disk instead.

Allows multiple documents to be open simultaneously Each yes answer is followed by the number of word processing display regions that can be open in active memory at one time.

Text formatting All programs allow you to create headers and footers.

Variable page length within document A yes answer to this question means that the program allows adjustment of page length without the need for hard (forced) page breaks, which all the packages support.

Paragraphs remain on a single page Some packages allow you to ensure that a paragraph is never split across two pages. This capability can be structured to prevent widows and orphans. (In this context, the first line of a paragraph is called an "orphan" if it appears alone at the bottom of a page. A "widow" occurs when the last line of a paragraph appears alone at the top of a page.)

Tabs All of the packages reviewed provide standard (left) tab stops. All tabs means that a package can also create center tabs (around which text is centered), right tabs (with text moving left from each tab), and decimal tabs (where columns of numbers can be aligned).

Fonts For all products, printer support includes support for a printer's resident fonts.

Maximum number of screen lines on document display indicates the maximum number of lines available in the work area using any selectable display mode. *Framework XE* and *Microsoft Works* also support enhanced (43- or 50-line) displays.

WYSIWYG There are varying degrees of WYSIWYG ("What You See Is What You Get"), which implies that the display screen matches the printed output. A yes answer indicates that the program can display (in a preview mode during editing) some degree of true on-screen fonts, pagination, headers and footers, margins, and line spacing.

Displays Graphics refers to the ability to display graphics brought into the word processor by any means, not to display them within the graphics module.

Block commands All of the packages can treat a defined block of text as a unit for copying, deleting, or moving within a file. They can all save a block of text as a separate text file, although this procedure may involve blocking the text, opening a new file, and pasting the block.

Direct data transfer throughout this table means that the program can move data between its various modules without any intermediary file conversion or export/import step. In some cases this may require an embedded command.

File import and export formats All programs offer ASCII import and export.

Spell-checks single words A yes answer to this question means the program performs the function without making you first block the word.

Hyphenation means that the program can automatically hyphenate words at the ends of lines, using a built-in dictionary or a hyphenation algorithm.

Corporate and professional features All of the packages can perform mail-merge activities and draft printing.

Document summary indicates that the program can produce a profile of each document, including the author's name, the date of creation, a description, and often the revision number.

Template documents are special files containing format settings that can be applied to text.

DATABASE

Maximum field size, fields per record, and records per data file are based on a program's fixed limitation or on the length of a typical alphanumeric field and record. Check with the vendor or dealer before purchasing if you plan to build a large database; a low-end integrated program may not be appropriate.

Record creation is accomplished via painting (the ability to place a field anywhere on-screen) or by **automatic field-name placement** (the program automatically puts the specified database fields in fixed positions on-screen). All products offer painting for record setup.

Data field types All packages reviewed support character, numeric, and date fields.

Data manipulation All products can sort on any field and in ascending or descending order.

Search parameters: all occurrences All of the packages can search for the first occurrence of a specified string, but only some of them can search the database for every occurrence of that string.

Paints screen means that the package lets you design a free-form printed report by placing database fields where you choose.

SPREADSHEET

Maximum spreadsheet size is fixed for all programs with two exceptions. The row/column proportions of *Enable/BP* and *Framework XE* are scalable within their stated maximum cell limits.

SOFTWARE

INTEGRATED SOFTWARE

Named ranges A yes answer means that a region of the spreadsheet can be stored and given a simple plain-English name. Such names can be used in place of the conventional cell references in formulas, functions, and commands.

Split windows A yes answer means that you can partition the spreadsheet vertically or horizontally so that you can work with at least two distinct areas of spreadsheet data independently.

Number of spreadsheet functions Because each package uses its own scheme for classifying spreadsheet functions, we provide a total count of available functions (not including operators such as +, -, *, and /). All of the packages support mathematical, trigonometric, and statistical functions, but they differ in their support of logical, financial, and date functions. If you need particular functions, be sure to check before making a purchase.

Printing All of the packages can print spreadsheets larger than 80 columns wide.

GRAPHICS

Built into spreadsheet A yes answer indicates that the program can take spreadsheet data and convert it into a graph from within the spreadsheet module (as does Lotus 1-2-3, Version 2.0). Some programs that have standalone graphics modules also include some graphing capability in the spreadsheet.

Standalone module A yes answer means that the graphics component is not a subset of the spreadsheet component but a standalone module with charting or drawing capabilities.

Dynamic links to spreadsheet are active, logical connections from the spreadsheet's data files to the graphics. If the spreadsheet data changes, the graph will automatically reflect that change.

Chart types All programs except *DeskMate* include support for vertical-bar, pie, and line charts. Horizontal and vertical bar chart support may include variations like cumulative bar charts and stacked bar charts. Pie charts may include exploded pie charts.

Drawing tools provide the ability to create graphics primitives like lines, boxes, ellipses, and polygons.

Graphics manipulation means that you can modify an image using commands such as size, rotate, flip, duplicate, overlay, and zoom.

COMMUNICATIONS

All of the programs that have communications modules can create an automated procedure for logging onto another computer or service.

Unattended file transmission refers to the automated process of dialing, handshaking, and file transmission.

Transmission rates All of the packages with communications modules support at least the common transmission rates of 300, 1,200, 2,400, and 9,600 bits per second.

File transfer protocols None of the programs support any type of CompuServe or Modem 7 protocol.

Products listed in ascending price order

	Eight-In-One	Personal Office	DeskMate	Framework XE	LotusWorks	Microsoft Works	PFS:First Choice	Venture	Enable/BP
List price	\$59.95	\$79.95	\$99.95	\$149.00	\$149.00	\$149.00	\$149.00	\$149.00	\$199.00
GENERAL FEATURES									
Total disk space used by installed package	1.5MB	1MB	2.4MB	2.3MB	1.6MB	1.4MB	1.3MB	3.1MB	2.1MB
Number of 5.25-inch floppy disks	5	3	9	12	3	8	4	5	9
Number of 3.5-inch floppy disks	3	3	5	7	2	4	2	3	5
Can fit on one 3.5-inch floppy disk for laptop use	☐	☐	☐	☒	☐	☒	☒	☐	☐
Can create shell for other applications	☐	☐	☒	☒	☐	☒	☒	☒	☐
Network version available	☐	☐	☒	☐	☒	☒	☒	☐	☒
Command strategies:									
Command line	☐	☐	☐	☐	☒	☐	☐	☐	☒
Automation through macros	☐	☐	Optional (\$19.95)	☒	☒	☒	☒	Optional (\$19.95)	☒
Windowing capabilities:									
Maximum number of active windows	1	1	2	32,000	30	8	1	1	8
Maximum number of displayable windows	1	1	2	Limited by disk space	2	8	1	1	8
Maximum number of active applications	1	1	2	7	5	4	1	1	5
Uses place markers while moving among applications	☐	☐	☐	☒	☐	☒	☒	☐	☒
File handling:									
Copies files	☒	☐	☒	☒	☒	☒	☒	☒	☒
Moves files	☐	☐	☐	☒	☐	☐	☒	☐	☐
Formats disks	☒	☐	☒	☐	☒	☒	☒	☐	☐

 —Editors' Choice

☒ —Yes

☐ —No

N/A—Not applicable: The product does not have this feature.

*—See the introductory captions for related features common to all the packages.

CONTINUES

It's simple math.

MATH CoPROCESSOR

$MTBF + C_s + C_H$

$$Q = \frac{MTBF + C_s + C_H}{R_R}$$

- Q-(QUALITY)
- C-(COMPATABILITY)
- S-(SOFTWARE)
- H-(HARDWARE)
- MTBF-(MEAN-TIME-BETWEEN-FAILURE)
- R_R-(RETURN RATE)

iit
RETURN
RATE

INDUSTRY
RETURN
RATE



*Our iit Advanced Math CoProcessors have a return rate one-fifth that of the industry standard.**

Here's proof that iit Advanced Math CoProcessors are perfect additions to your 286, 386, or 386 SX PC. They are compatible with application software that supports math coprocessors. And they are compatible with popular PC operating systems, including DOS, UNIX, and OS/2, and GUI's like Windows 3.0.

With this kind of quality, we can guarantee the iit Advanced Math CoProcessor for the lifetime of your computer. We back our *Lifetime Warranty*** with state-of-the-art wafer processing, packaging,

Our chip is better by 5:1.

QUALITY FORMULA

QUALITY

SOFTWARE HARDWARE RELIABILITY

CS SH MTBF

$Q = IIT$

Math

rigorous process control, and testing. No wonder we have a lower return rate and better reliability than the industry standard.

Our Advanced Math CoProcessors speed up your graphics, CAD/CAE, spreadsheets, and other calculation-intensive applications. They are certified by leading application software vendors, BYTE-rated, and guaranteed for the lifetime of your computer.

For quality, compatibility, and performance, specify iit Advanced Math CoProcessors. Call 1-800-832-0770 for your nearest dealer.

*For quality in mathematics,
count on iit.TM*



SOFTWARE INTEGRATED SOFTWARE

LOW-END INTEGRATED SOFTWARE: SUMMARY OF FEATURES

									
GENERAL FEATURES (continued)									
Renames files	☒	☒	☒	☒	☒	☒	☒	☒	☒
Performs automatic backups	☒	☒	☒	☒	☒	☒	☒	☒	☒
Other operations	DISKCOPY	None	CD, DISKCOPY, MD, RD	CD, RD	None	Date, time	DISKCOPY, MD, RD	None	Directory sort, string search, view
File access security	☒	☒	☒	☒	☒	☒	☒	☒	☒
Device support*:									
Math coprocessor	☒	☒	☒	☒	☒	☒	☒	☒	☒
Color printers	☒	☒	☒	☒	☒	☒	☒	☒	☒
HP LaserJet III	☒	☒	☒	☒	☒	☒	☒	☒	☒
PostScript printers	☒	☒	☒	☒	☒	☒	☒	☒	☒
Plotters	☒	☒	☒	☒	☒	☒	☒	☒	☒
Mice	☒	☒	☒	☒	☒	☒	☒	☒	☒
Desktop accessories:									
Alarm	☒	☒	☒	☒	☒	☒	☒	☒	☒
Calculator	☒	☒	☒	☒	☒	☒	☒	☒	☒
Calendar	☒	☒	☒	☒	☒	☒	☒	☒	☒
Date book	☒	☒	☒	☒	☒	☒	☒	☒	☒
Phone directory	☒	☒	☒	☒	☒	☒	☒	☒	☒
Other	Label maker, memo, to-do list, world clock	Distances, expenses, postage/unit conversion, world clock	Clipboard, notepad, to-do list	Phone dialer, to-do list	Phone dialer	Phone dialer	Phone dialer	None	None
Help*:									
On-line tutorial	☒	☒	☒	☒	☒	☒	☒	☒	☒
Quick reference card	☒	☒	☒	☒	☒	☒	☒	☒	☒
WORD PROCESSOR									
Maximum document size	150K	Limited by RAM	50K	Limited by RAM	64K	Limited by disk space	64K	Limited by RAM	Limited by RAM
Holds all pages in memory	☒	☒	☒	☒	☒	☒	☒	☒	☒
Allows multiple documents to be open simultaneously	☒	☒	☒	☒	☒	☒	☒	☒	☒
Maximum number of open documents	1	1	2	32,000	9	8	1	1	8
Maximum amount of EMS support	N/A	N/A	N/A	16MB	336K	N/A	N/A	N/A	N/A
Text formatting*:									
Variable page length within document	☒	☒	☒	☒	☒	☒	☒	☒	☒
Variable line spacing within document	☒	☒	☒	☒	☒	☒	☒	☒	☒
Paragraphs remain on a single page	☒	☒	☒	☒	☒	☒	☒	☒	☒
Multicolumn documents	☒	☒	☒	☒	☒	☒	☒	☒	☒
Right tab/All tabs*	☒	☒	☒	☒	☒	☒	☒	☒	☒
Bullets	☒	☒	☒	☒	☒	☒	☒	☒	☒
Supports cartridge fonts	☒	☒	☒	☒	☒	☒	☒	☒	☒
Supports downloadable fonts	☒	☒	☒	☒	☒	☒	☒	☒	☒
Screen displays:									
Maximum number of screen lines on document display	21	21	21	46	22	53	21	21	21
WYSIWYG	☒	☒	☒	☒	☒	☒	☒	☒	☒
Displays graphics	☒	☒	☒	☒	☒	☒	☒	☒	☒
On-screen ruler available	☒	☒	☒	☒	☒	☒	☒	☒	☒
Status indicator line:									
Column number	☒	☒	☒	☒	☒	☒	☒	☒	☒
Current drive and path	☒	☒	☒	☒	☒	☒	☒	☒	☒
Filename	☒	☒	☒	☒	☒	☒	☒	☒	☒
Line number	☒	☒	☒	☒	☒	☒	☒	☒	☒

—Editors' Choice ☒—Yes ☐—No

N/A—Not applicable: The product does not have this feature.

*—See the introductory captions for related features common to all the packages.

CONTINUES

Healthy People — Healthy Business



VDT Radiation Risk: Fact or Myth

There's much talk these days over whether it's safe to work in front of a computer for long periods of time. Several current studies conclude that there may be danger in prolonged exposure to Video Display Terminal (VDT) radiation. Other research fails to substantiate it. Still more studies are planned, to try to settle this question.

Rather than waiting, we have introduced the first affordable line of high-performance personal computers with low radiation, Super VGA monochrome and color monitors. In fact, Copam monitors beat tough safety standards established in health-conscious Sweden. And although it involves additional technology and cost, we don't charge more for this healthy benefit.



Our concern over the well-being of Copam users is one more example of our commitment to excellence in every aspect of our products.

As a manufacturer of personal computers and monitors, we engineer quality into every system we make. The Copam line ranges from economical, space-saving slim-lines to high-power EISA systems capable of running a good-sized company.

As scientists continue to debate, one thing is clear: while there's no proof that VDT radiation is potentially hazardous, there's no doubt that less of it is healthier. So don't wait—get a healthy computer from your authorized Copam dealer today!

For the Copam dealer nearest you call 1-800-828-4200



286 MV/12



386 SXB/16
386 B/25 & 33
486 B/25



386 V/33 EISA
486 V/25 EISA

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SOFTWARE INTEGRATED SOFTWARE

LOW-END INTEGRATED SOFTWARE: SUMMARY OF FEATURES

	Eight-in-One	Personal Office	DeskMate	Framework XE	LotusWorks	Microsoft Works	PFS:First Choice	Venture	Enable/BP
WORD PROCESSOR (continued)									
Block commands*:									
Copies block to another file	■	□	■	■	■	■	■	■	■
Moves block to another file	■	□	■	■	■	■	■	■	■
Formats block	■	□	■	■	■	■	■	■	□
Prints block	□	□	■	■	■	□	■	□	■
Maximum size of block	Limited by RAM	Limited by RAM	16K	Limited by RAM	5.5K	Limited by RAM	20K	Limited by RAM	Limited by RAM
Search-and-replace:									
Case-sensitive	■	■	□	■	■	■	□	■	■
Forward/backward	■/□	■/□	■/□	■/■	■/■	■/■	■/□	■/□	■/■
Global replace	■	■	□	■	■	■	■	■	■
Uses wildcards	□	□	■	■	■	■	□	□	■
Direct data transfer:									
To/from database module	□/□	□/■	■/■	■/■	■/■	■/■	□/■	■/■	■/■
To/from spreadsheet module	□/□	□/□	□/■	■/■	■/■	■/■	■/■	■/■	□/■
To/from graphics	□/■	□/□	□/■	■/■	□/■	□/■	□/■	□/□	□/■
File Import and export formats*:									
DCA	□	□	□	■	□	Optional (\$5)	■	□	■
Microsoft Word	□	□	□	■	□	Optional (\$5)	■	□	□
MultiMate	□	□	□	■	□	□	■	□	■
WordPerfect	□	□	□	■	□	□	■	□	□
WordStar	□	□	□	■	□	□	■	□	■
Other	.PCX	None	None	Framework III	None	Rich Text Format (\$5 option)	OfficeWriter, PFS: Professional Write, Wang PC	None	.DIF, Easy Writer, Peachtext, Volkswriter
Tools:									
Spell-checking:									
Number of words in dictionary	100,000	100,000	90,000	80,000	100,000	100,000	75,000	90,000	80,000
Spell-checks single words	■	□	□	■	■	■	□	□	□
Spell-checks defined block	□	□	■	■	■	■	■	■	□
Hyphenation	■	□	□	■	■	□	□	□	■
Thesaurus	■	□	Optional (\$19.95)	□	■	■	■	Optional (\$19.95)	□
Word count	■	■	□	□	■	□	□	□	■
Corporate and professional features*:									
Document summary	□	□	□	□	□	□	□	□	■
Footnotes and endnotes	□	□	□	□	□	■ (endnotes only)	□	□	■
Hidden comments	□	□	□	■	□	□	□	□	■
Indexed document	□	□	□	■	□	□	□	□	■
Outlining	■	□	Optional (\$19.95)	■	□	□	□	■	■
Table of contents	■	□	□	■	□	□	□	□	■
Template documents	■	■	□	■	■	■	■	■	□
DATABASE									
File structure:									
Maximum field size (characters)	254	78	980	64,000	254	256	19,656	882	254
Maximum number of fields per record	128	20	22	32,000	128	256	740	146	254
Maximum number of records per data file	Limited by disk space	Limited by RAM	3,894	2,900	Limited by disk space	Limited by RAM	250	Limited by RAM	65,000
Maximum number of open data files	1	1	2	32,000	9	8	1	1	8
Maximum amount of EMS support	N/A	N/A	N/A	4MB	448K	4MB	N/A	N/A	N/A
Automatic field-name placement*	□	□	□	■	□	□	□	■	□

■—Editors' Choice

■—Yes □—No

N/A—Not applicable: The product does not have this feature.

*—See the introductory captions for related features common to all the packages.

CONTINUES

LOW-END INTEGRATED SOFTWARE: SUMMARY OF FEATURES

	Eight-in-One	Personal Office	DeskMate	Framework XE	LotusWorks	Microsoft Works	PFS:First Choice	Venture	Enable/BP
DATABASE (continued)									
Data field types*:									
Currency	☐	☐	☒	☒	☐	☒	☐	☒	☒
Boolean	☒	☐	☐	☒	☒	☒	☒	☐	☒
Other	Memo	Whole number	None	Percent, scientific	Memo	Time	None	Phone number, SSN, ZIP code	Phone number, state code, ZIP code
Direct data transfer:									
To/from word processor module	☐ / ☐	☒ / ☐	☐ / ☐	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☐	☐ / ☒	☒ / ☒
To/from spreadsheet module	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☒	☒ / ☒	☒ / ☒	☐ / ☐	☐ / ☒	☒ / ☒
To/from graphics	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☒	☐ / ☐	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☒
Data import/export formats:									
ASCII	☒ / ☒	☐ / ☐	☐ / ☒	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☒
.DIF	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☐	☒ / ☒	☐ / ☐	☐ / ☐	☐ / ☐	☐ / ☐
Other	None	None	None	.DBF	.DBF	None	None	.DBF	.DBF, .WK1, .WKS, Condor3, PC-File III
Data manipulation*:									
Can join data files	☒	☒	☐	☒	☒	☐	☐	☐	☒
Can index fields	☒	☐	☐	☐	☒	☐	☐	☐	☒
Maximum number of indexed fields	3	N/A	N/A	N/A	8	N/A	N/A	N/A	10
Search parameters:									
All occurrences*	☐	☒	☒	☒	☒	☒	☒	☒	☒
Index field only	☒	N/A	N/A	N/A	☒	N/A	N/A	N/A	☒
Multiple fields	☐	☒	☒	☒	☒	☒	☒	☒	☒
Maximum number of multiple fields	N/A	Unlimited	5	Unlimited	Unlimited	3	Unlimited	Unlimited	8
Wildcard or string segment	☒	☐	☒	☒	☒	☒	☒	☒	☒
Mathematical/statistical functions	☒ / ☐	☒ / ☐	☒ / ☐	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☐	☒ / ☐	☒ / ☒
Report generation:									
Generates mailing labels	☒	☒	☐	☒	☒	☒	☒	☒	☒
Prints screen	☒	☐	☒	☒	☒	☐	☐	☐	☒
SPREADSHEET									
Maximum spreadsheet size (rows by columns)	30,000 x 10,000	200 x 52	99 x 99	190 x 190	8,192 x 256	4,096 x 256	1,024 x 768	999 x 255	255 x 255
Maximum amount of EMS support	N/A	N/A	N/A	4MB	224K	4MB	N/A	N/A	N/A
Worksheet features:									
Named ranges	☐	☐	☐	☐	☒	☒	☐	☐	☒
Split windows	☐	☐	☐	☐	☒	☒	☐	☐	☒
Hidden columns	☐	☐	☐	☒	☐	☒	☐	☒	☒
Cell protection	☐	☒	☐	☒	☒	☒	☐	☒	☒
Spreadsheet merge	☒	☐	☒	☒	☐	☒	☐	☒	☒
Maximum number of open spreadsheets	1	1	2	32,000	9	8	1	1	8
Direct data transfer:									
To/from word processor module	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☒	☒ / ☐	☐ / ☒	☒ / ☐	☒ / ☒	☒ / ☒
To/from database module	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☒	☒ / ☒	☒ / ☒	☐ / ☐	☒ / ☐	☒ / ☒
To/from graphics	☐ / ☐	☒ / ☐	☐ / ☐	☒ / ☒	☒ / ☐	☒ / ☐	☒ / ☐	☒ / ☐	☒ / ☒
File import/export formats:									
ASCII	☐ / ☐	☐ / ☐	☐ / ☒	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☒	☐ / ☒	☒ / ☒
.DIF	☒ / ☒	☐ / ☐	☐ / ☐	☒ / ☐	☐ / ☐	☐ / ☐	☐ / ☐	☐ / ☐	☒ / ☒
.WK1	☒ / ☒	☐ / ☐	☐ / ☐	☒ / ☐	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☒	☒ / ☒
.WKS	☒ / ☒	☐ / ☐	☐ / ☐	☒ / ☒	☒ / ☐	☒ / ☒	☒ / ☒	☐ / ☐	☒ / ☒

 — Editors' Choice ☒ — Yes ☐ — No

N/A — Not applicable: The product does not have this feature.

* — See the introductory captions for related features common to all the packages.

CONTINUES

The Bulk Of Relational Databases



es vs. The Brains Of New Q&A.

Introducing Q&A™ 4.0.

Bulk vs. Brains. Everywhere we turn, businesses are trimming the fat. Bulk is out. Brains are in. Which brings us to the business of bulky relational databases. Not that these complex entities (originally designed, by the way, for gigantic mainframe computers) don't have their place. But using a bulky relational database for most business tasks today is like planting a begonia with a bulldozer.

It's time for a change, to increase productivity. Loosely translated, time to use brains, not bulk.

For several years, Q&A™ has been the database of choice for smart business people who didn't need an over-engineered, and frequently over-priced relational database. Now with the power and programming tools of new version 4.0, Q&A is quite simply the better choice. For everybody.

Relational Features. If you really do need relational capabilities, here's the good news: Q&A 4.0 applications can now directly access data from external Q&A or dBASE databases, and post to external databases as well. In short, Q&A 4.0 can help you create powerful database solutions faster than with a relational database. And without all the hassle.

Easy Connectivity. Integrating Q&A databases into your existing system is no hassle either, since Q&A is compatible with all the major micro-computing standards for data (dBASE, Paradox, Professional File, Lotus 1-2-3) and word processing (WordPerfect, Word, WordStar, MultiMate and Professional Write). With the appropriate links, you can even bring in data from SQL tables—selectively if desired—to create a new, easy-to-use Q&A database.

And if you're interested in maximizing work-group productivity, you'll appreciate Q&A 4.0's network support, which includes automatic record locking, instant screen updates, and seven levels of access rights.

Application Programming Tools. If you create applications for other people, you'll be able to do it a

lot faster now. Q&A 4.0's complete set of Application Programming Tools make it simple to create sophisticated applications with user-friendly features such as specialized help screens, field-level security, and an enhanced programming environment. You can even customize database applications by creating your own menus to replace the ones that come with Q&A.

The Agile Alternative. And finally, if you just want a simple solution to business problems, we haven't forgotten you. For all its new power, version 4.0 is as easy to use as its popular predecessor.

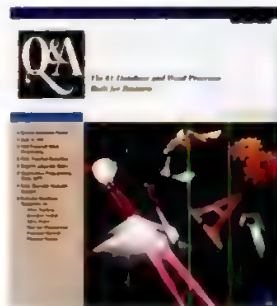
Product managers, sales reps, assistants, and vice presidents can use Q&A 4.0's Query Guide to quickly build their own database queries using English phrases, and produce hundreds of flexible reports, including cross tab reports.

Using Q&A's integrated word processor with a built-in spell checker and thesaurus, page preview, and expanded mail-merge, you can also generate form letters and mailing labels, instantly. And of course, create professional-looking documents with scalable fonts. Q&A brings new productivity to every office in the organization, and particularly to the micro manager's office, which is no longer bombarded by calls from department heads clamoring for new reports and program modifications.

Our Demo Proves It! Quite frankly, it's hard to convey the intuitive feel of Q&A 4.0 in a few sentences, and it's impossible to list all of its features in one ad. But by calling us now you can get the full story. And a free demo disk that proves it.

Companies that put productivity first like American Express and PepsiCo have been using Q&A for years—and Q&A can make the difference in your organization, too. So if you're tired of excess database baggage and are interested in doing more with less, there's a really smart thing you can do about it.

Call right now.



Free Demo Disk* (800) 228-4122 Ext. 102-P

Upgrade information: (800) 228-4122 Ext. 101; (800) 465-2266 in Canada

SYMANTEC.

CIRCLE 117 ON READER SERVICE CARD

Symantec Corporation, 10201 Torre Ave., Cupertino CA 95014, (408) 253-9600.

*Demo Disk offer limited to North America. Outside North America please call (408) 253-3570 for the name of your local Symantec office or distributor. Q&A is a trademark of Symantec Corporation. Other brands and products are trademarks of their respective holders. © 1991 Symantec Corporation

SOFTWARE

INTEGRATED SOFTWARE

LOW-END INTEGRATED SOFTWARE: SUMMARY OF FEATURES

	Eight-in-One	Personal Office	DeskMate	Framework XE	LotusWorks	Microsoft Works	PFS:First Choice	Venture	Enable/BP
SPREADSHEET (continued)									
Other	None	None	None	SYLK	None	None	PFS: Professional Plan	None	SuperCalc 3, SYLK, VisiCalc
Spreadsheet functions:									
Date and time	■	□	□	■	■	■	■	□	■
Financial	■	□	□	■	■	■	■	■	■
Logic	■	■	□	■	■	■	■	■	■
Sorting by row/column	□/□	□/□	□/□	■/□	■/□	■/□	□/□	■/□	■/■
Number of spreadsheet functions	42	28	16	73	74	56	72	35	81
Printing*:									
Can create shaded areas	□	□	□	□	□	□	□	■	□
Can create boxes	□	□	□	□	□	□	□	■	□
Prints in landscape mode	□	□	■	■	■	■	□	■	■
Prints defined range	■	■	■	■	□	■	■	■	■
GRAPHICS									
Built into spreadsheet	■	□	□	■	■	■	■	□	■
Standalone module	■	■	■ (paint module only)	■	□	□	■	■	□
Amount of EMS support	N/A	N/A	N/A	16MB	224K	4MB	N/A	N/A	N/A
Direct data transfer:									
To/from word processor module	□/□	□/□	■/□	■/■	■/□	■/□	■/□	□/■	■/□
To/from database module	□/□	□/□	■/□	■/■	□/□	□/□	□/□	□/□	□/■
To/from spreadsheet module	□/□	□/■	□/□	■/■	□/■	□/■	■/■	□/■	□/■
Dynamic links to spreadsheets	□	□	□	■	■	■	□	□	■
Graph export formats	.PCX	None	None	None	None	None	Harvard Graphics, PFS:First Publisher, PFS: Professional Write	DeskMate	None
Chart types*:									
Area	■	□	□	□	□	■	■	□	□
Horizontal bar	□	■	□	□	□	□	□	□	□
Tables	□	□	□	□	□	□	□	■	□
Text	□	□	□	□	□	□	■	□	□
3-D	□	□	□	□	□	□	□	□	■
Other	x,y graph	x,y graph	None	High-low, x,y graph	x,y graph	High-low, x,y graph	None	x,y graph	High-low, x,y graph
Automatic legends	□	□	□	■	■	■	□	■	□
Combination charts	□	□	□	□	□	□	□	■	□
Drawing tools	□	□	■	■	□	□	□	□	□
Graphics manipulation	□	□	■	□	■ (scaling)	□	□	□	□
Multiple y axes	□	□	□	□	□	■	□	□	□
COMMUNICATIONS									
Automatic redial	□	□	□	■	■	□	□	N/A	■
Unattended file transmission	□	■	□	■	■	□	□	N/A	■
Modem support:									
Transmission rates	All	All	All	All	All	All	All	N/A	All
Hayes extended command set	■	■	■	■	□	■	□	N/A	□
File transfer protocols:									
ASCII	■	■	■	■	■	■	■	N/A	■
Kermit	□	■	□	■	■	□	□	N/A	■
One form of X modem	■	■	■	■	■	■	■	N/A	■
One form of Y modem	□	■	□	■	■	□	□	N/A	□
Other	None	Z modem	None	CrossTalk, SmartComm	None	None	None	N/A	Enable

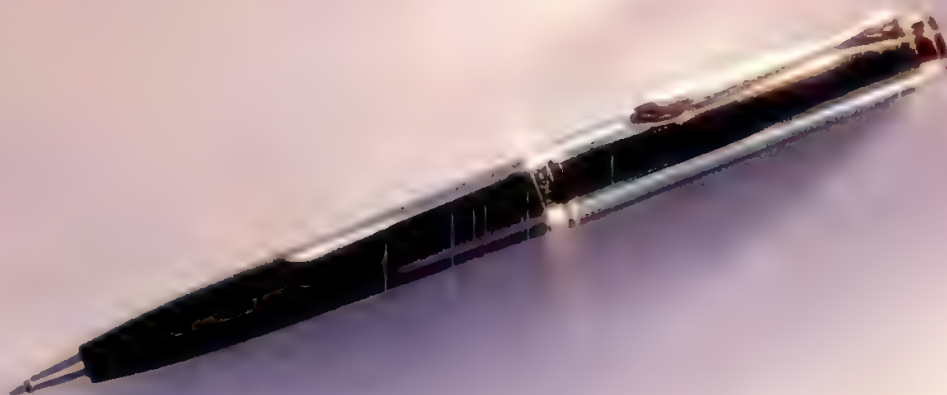
■—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

*—See the introductory captions for related features common to all the packages.

ENDS

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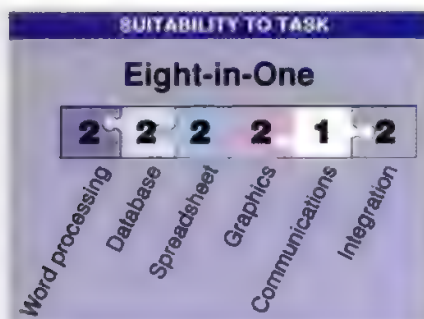
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increments between 12 and 2.4 lines per inch—is a snap, as is marking blocks and cutting and pasting. For transfers other than text file to text file (such as transferring a spreadsheet to the word processor), you'll have to export the block or file, enter the destination file, and import the data into a new or existing file.

If you leave the word processor (or any other module) and return to it later without exiting the program, the file you were working on automatically reloads. Other helpful features include justification, auto-hyphenation, file sort (by line), and a page-preview function that displays typefaces and any .PCC or .PCX files (including those created in the graphing module) you've set to merge at print time. Along with the @picture command you insert into your document, you can set for position, scale, color inversion, and spacing.

Eight-in-One's search features are limited to part or whole word matches and do not allow for wildcards in search-and-replace. The 100,000-word spell-checker flags words like "that's" along with pairs of words separated by a dash or hyphen. In addition to the understandable lack of cartridge and soft font support, you cannot double-up on attributes to create bold underlined text.

SPREADSHEET COMPATIBILITY

Eight-in-One's spreadsheet module offers an astounding 30,000-row by 10,000-column maximum workspace, but the lack of EMS support restricts you from building a file this large before you run out of RAM. (A formula-free file we created hit the ceiling at about 6,700 cells.) When you need to upgrade, the package offers good import and export to .WK1, .WKS, and .DIF formats. Its 42 functions include logic, date and time, and financial. You can even define type styles for printing.

One handy feature is the way *Eight-in-One* saves a block of cells to memory. Unlike *Lotus 1-2-3's* Copy command, *Eight-in-One* "memorizes" a batch of

SOFTWARE INTEGRATED SOFTWARE

cells that you can copy repeatedly throughout your document.

The spreadsheet facilities are limited by the absence of several features—sorting, named ranges, cell protection, and split windows. But remember the \$59.95 price. You can merge files, but only by importing or exporting or by memorizing a block of cells and then calling up the destination file.

Eight-in-One's database module does not retain an entire database in RAM. This is a welcome feature since the package does not support memory beyond 640K. The program allows you to save up to three indexes in a separate .NDX file, although you can search only on an index field.

GRAPHS AND PALETTES

Eight-in-One's graphics module—part standalone, part incorporated into the spreadsheet—permits the usual pie, line, and column charts plus *x,y* and area. When using a black-and-white printer for any but line and *x,y* graphs, you'll need to avoid color palettes. They won't translate to gray-scale upon printing. Instead, your best bet is the black-and-white palette and a choice of five shadings.

If you're a new user interested in *Eight-in-One*, Spinnaker has an offer to clinch your decision. If you return the package within 90 days of purchase, Spinnaker will take back your copy and let you apply its cost to the purchase of an integrated package of your choice.

Enable/BP

Enable/BP is one of the new offerings on the low-cost integrated shelf. By spinning off *Enable/BP* from the high-end *Enable/OA*, Enable Software established the path later followed by Ashton-Tate's *Framework XE*: If you have the high-end technology, repackaging as much of it as you can for the low end while still making a profit.

Enable/BP is so full of imaginative features that it's difficult to argue against its \$199 price. Its disadvantages include the lack of a common user interface across modules—a feature available in even the cheapest integrated packages—and a formidable learning curve. Not even *Enable/BP's* comprehensive documenta-

FACT FILE

Enable/BP
Enable Software
Inc., Northway Ten
Executive Park,
Ballston Lake, NY
12019; 800-766-
7079, 518-877-
8600.

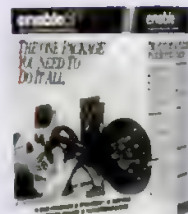
List Price: \$199.

Requires: 448K

RAM (384K for

DOS 2.0 or 2.1), graphics adapter, DOS 2.0 or later. Hard disk recommended

In Short: *Enable/BP* offers a full-featured set of applications, but the typical user faces a high learning curve. *Enable/BP* also needs a common interface across modules, a standard consideration for this type of software.



CIRCLE 402 ON READER SERVICE CARD

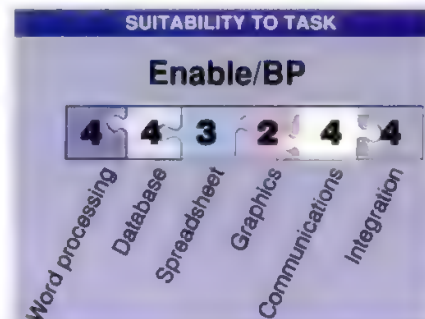
tion and on-line tutorials are enough to guide the small-business user through the program's unharnessed power.

The package contains a word processor, spreadsheet with graphics, database, and communications. A scientific calculator in the word processor is the only desktop utility included. You can have eight windows active simultaneously, as with *Microsoft Works*, and smoothly transfer data from one window (or one module) to another.

SKILLFUL WORD PROCESSOR

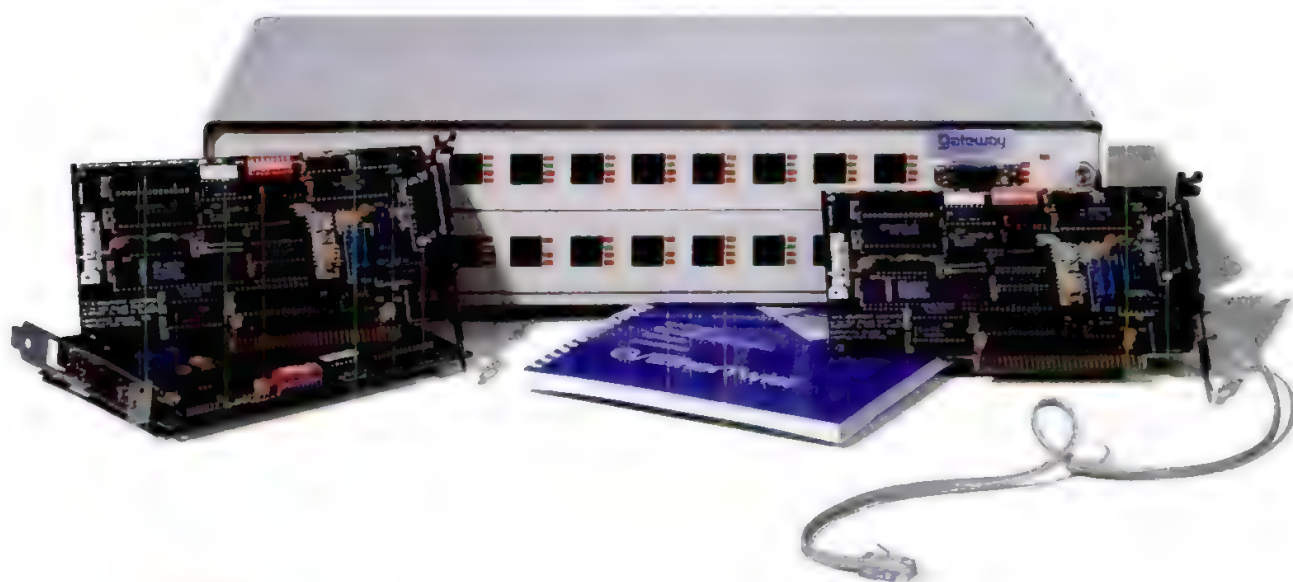
Enable/BP's word processor may be the most powerful among all the packages evaluated here, despite the package's lack of support for memory beyond 640K. In text handling, for instance, this is the only program that lets you mark noncontiguous portions of text (aside from the blocking function) for moving, copying, or deleting.

Like *Framework XE*, *Enable/BP* has helpful abbreviation handling. The differ-





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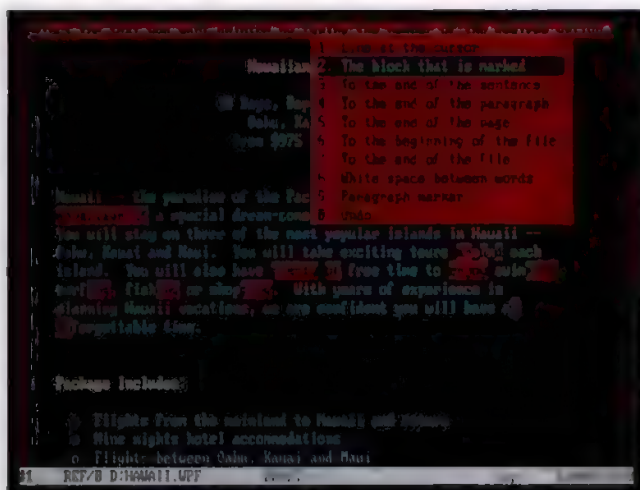
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SOFTWARE INTEGRATED SOFTWARE



Aside from blocking functions, *Enable/BP's* versatile marking function lets you copy, move, or delete noncontiguous portions of text.

In addition to providing automatic redial and unattended file transmission, the communications module is notable for the detailed way it annotates communications sessions for the user. *Enable/BP* translates each step of the software/modem efforts into information even a new user can appreciate.

Enable Software is to be commended for designing one of the most full-featured integrated packages in the under-\$200 market. If Enable Software puts as great an effort toward making the program's power more accessible, it could turn *Enable/BP* into the best buy as well.

Framework XE

ence is that *Enable/BP* lets you run the file through a one-step compile procedure to expand the abbreviations, while *Framework XE* expands each abbreviation after you type it. You can sort by line or paragraph, in ascending or descending order, and create a table of contents, indexes, and multicolumn documents. Another welcome feature, one that's also found in *LotusWorks*, is a transpose function that swaps the positions of the two letters preceding the cursor.

The word processor includes other useful features, but there are compromises as well. As in *Framework XE*, *Enable/BP's* spell-checker contains only 80,000 words (several others have 100,000 words). And it flagged words like "that's" and pairs of words separated by dashes, as did *Eight-in-One*.

Enable/BP's mail-merge function is much too cumbersome for a low-end package. It's certainly a plus that Enable Software built the high-end *Enable/OA's* procedural language into *Enable/BP* (Ashton-Tate also provides its FRED language in both the high- and low-end *Framework*), but users who need formatted letters in addition to the templates provided should not be forced to wade through a maze of commands like "if," "else," and "endif" in order to create a simple form letter.

DISTINGUISHED SPREADSHEET AND DBMS

When you enter the spreadsheet/graphics module, you'll see similarities to *Lotus 1-2-3* at work. The interface and many of the commands are quite similar, such as the "/" that brings up the menu. You can

also call up the menu with the program's usual F10 key.

Here, too, *Enable/BP* offers some truly helpful features that balance its low 65,025-cell workspace size. No other package we evaluated offers sorting by row or column. Other features that distinguish the spreadsheet are 81 spreadsheet functions, a transpose function for rows or columns, hearty import/export, and a fill series (also found in *Microsoft Works* and *PFS:First Choice*). There's also a Hilite feature that highlights all cells referring to your current cell and a means of displaying on-screen at once both a spreadsheet and its representative graph (hotlinked, if you like).

Enable/BP's database is a powerful module that supports a gamut of import/export formats. Unfortunately, the interface is completely different from the spreadsheet or the word processing modules. You have many options for designing, building, and maintaining a database, and the module's "Interact" menu option offers some help in accessing commands. Context-sensitive help could use the most improvement here and in the word processor to supplement the well-organized but sparsely indexed documentation.

One of the database module's many strengths is file linking. (It allows one file to index as many others as needed.) You can index up to ten fields, and once you are advanced enough to try *Enable/BP's* procedural language, you can use command-line reporting for when you need more than the simple customized or columnar report. And the program's graphing functions are as much tied to the database as they are to the spreadsheet.

Ashton-Tate's \$149 *Framework XE*, Version 1.0, shatters the myth that a low-end price means low-end functionality. Introduced in October 1990, *Framework XE* includes nearly all the features found in the \$695 *Framework III* and is going full throttle toward the market share of products like *Microsoft Works*; and it earns a hefty piece of that market.

Complete with word processor, spreadsheet, database, graphics, communications, and outliner, *Framework XE* also offers an electronic mail module that uses Action Technologies' Message Handling Service (MHS) protocol for sending messages to users of any other MHS-compatible e-mail system.

Another strength is its hearty upgrade



Framework XE,
Version 1.0
Ashton-Tate Corp.,
20101 Hamilton
Ave., Torrance,
CA 90509-9972;
213-329-8000.
List Price: \$149.
Requires: 640K
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adapter, DOS 2.0
or later; hard disk and DOS 3.0 or later
required for MHS e-mail.
In Short: Ashton-Tate has accomplished a
difficult feat by repackaging much of the
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XE* for the low-end user. *Framework XE* is
hard to beat.

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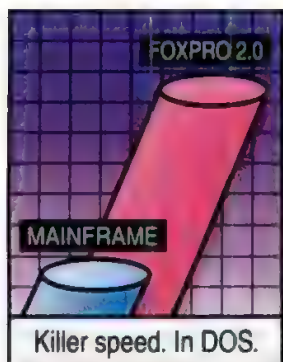
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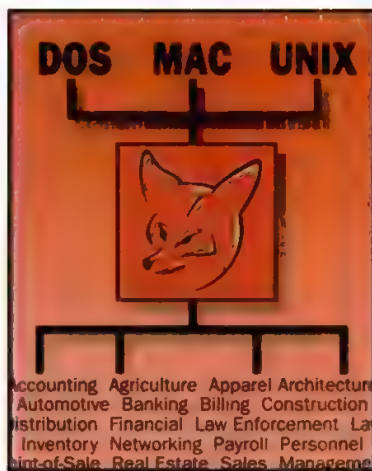
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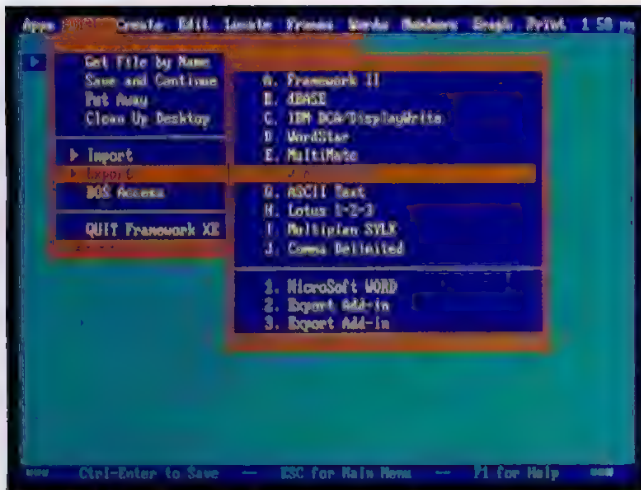
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SOFTWARE INTEGRATED SOFTWARE



Framework XE's Import/export menu is available from any module; here it has been invoked within the outline. The add-in slots at the bottom of the menu are intended for other file-conversion programs provided by the vendor.

options for when you outgrow the package. First, *Framework XE* files are fully compatible with those of *Framework III*. Second, the package offers conversion to and from most major file formats for word processing, spreadsheet, and database programs.

The programming language FRED is fully supported in the *XE* product, but full documentation is only in the program's on-line help. New users need never be exposed to this Pascal-related language, which augments the functionality of each module and the program as a whole. For advanced users, FRED is a welcome carryover from *Framework III*.

UNIQUE TERMINOLOGY

Ashton-Tate has done an admirable job of easing the novice user into the *Framework* approach to integrated computing. It begins with Quick-Start, an integrated application that greets the user with a menu of commonly used tasks. This is necessary for anyone who has previously worked with a PC to adjust to some new terms.

A "frame," the building block of the program, is a window that you can size, position, or overlap with other frames. A frame that contains subframes is a valuable tool in building a document with text, live spreadsheet data, hotlinked graphics, or database information—anything you want. This is the beauty of the program.

Whether you display or hide a frame, it is retained in memory with its name displayed in a tray. Use your mouse to click on the tray and open the frame. Disk drives are represented as "file cabinets," and the "library" is a containing

frame for macros, templates, and other useful functions.

Although there's no need to rename such items as disk drives, frames are clearly a unique concept. There is no practical limit on the number of frames you can open simultaneously. *Framework XE* supports up to 16MB RAM for word processing and graphics files, 4MB RAM for spreadsheet files, and 2MB for database files.

Framework XE's word processor supports a wide range of functions with few limitations. Page length, line spacing, widow/orphan control, and nonbreaking spaces can be set at any point in a document. The drawback we found is that accessing certain features, such as multiple line spacing and page length, requires you to spread a single document across two or more frames. *Framework XE's* outline can help you keep track of multiframe documents.

The spell-checker, like that found in *Enable/BP* and other programs reviewed, can run on any type of file, not just text files. The only drawback is its paltry 80,000-word dictionary, which is exceeded in size by all but two of the others we evaluated. Notably missing, too, are hyphenation and a thesaurus.

Other features, however, help to fill in the gap. Data transfer from application to application requires just a few keystrokes, with no practical limitation on the type of data you can transfer. Abbreviations, also available in *Enable/BP*, let you quickly type the most frequently used words. You can also search with a versatile set of wildcards.

Using proportionally spaced fonts

caused alignment problems in this package as well as in all others we tested except *Microsoft Works*. *Framework XE* supports cartridge fonts in addition to printer-resident, but downloadable fonts are not yet supported.

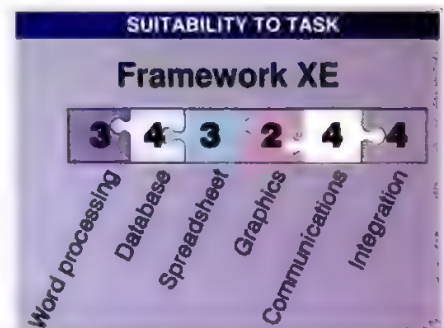
BALANCED SPREADSHEET

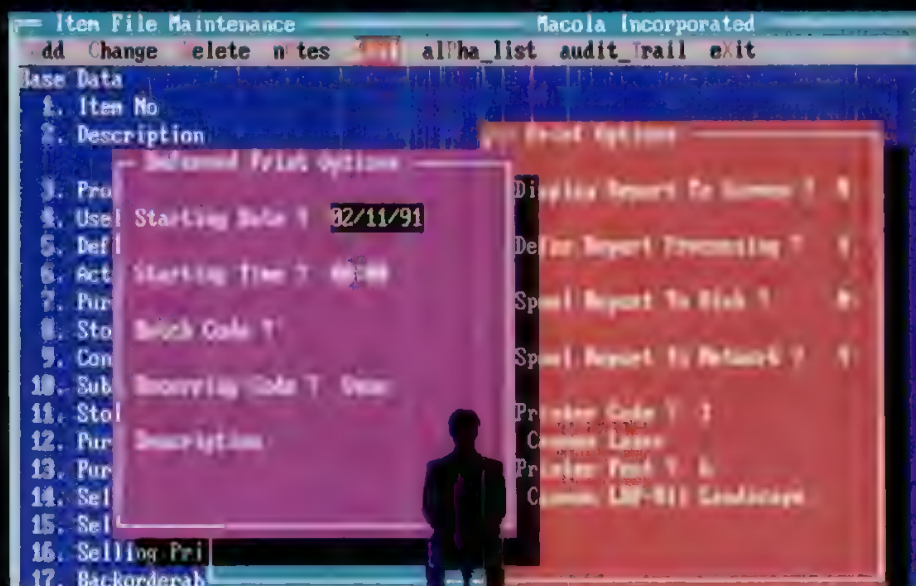
Framework XE's spreadsheet workspace is surprisingly limited at 190 rows by 190 columns, but you can adjust the rows and columns anywhere within the 36,000-cell maximum. As with many of the packages, you can access the maximum size only if you're using EMS. Otherwise, *Framework XE* gives you a 5,500-cell maximum. *Framework XE* supports file linking, by region or cell, to other spreadsheets, graphs, and database files, and it updates spreadsheet or graph links with every recalculation.

Spreadsheets cannot be split up over more than one frame. You cannot split windows into two independently scrolling sections as in 1-2-3, so you may find yourself jumping among frames. Locking columns and rows can help to minimize this. *Framework XE* balances these weaknesses with a range of features in addition to file linking, including abbreviations, type styles, search-and-replace, multiline formulas, and semicolon comments. Also, the program's spreadsheet documentation allows up to 64,000 characters for notes.

STRONG TIES TO dBASE

The database application, as you might expect, is closely tied to *dBASE IV* and accepts formats dating back to *dBASE II*. In addition to form and table views of your data, you can select a *dBASE* view, which arranges each field on a single line. Importation of .DBF files is easy in *Framework XE*, while export requires saving data to a temporary *dBASE* file and appending the temporary file to the destination database.





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Among the database's features are its search-and-replace with case sensitivity (using FRED), filter formulas that act on the entire frame, hidden fields, abbreviations, and locking fields. Seven date formats are available for the database as well as the spreadsheet.

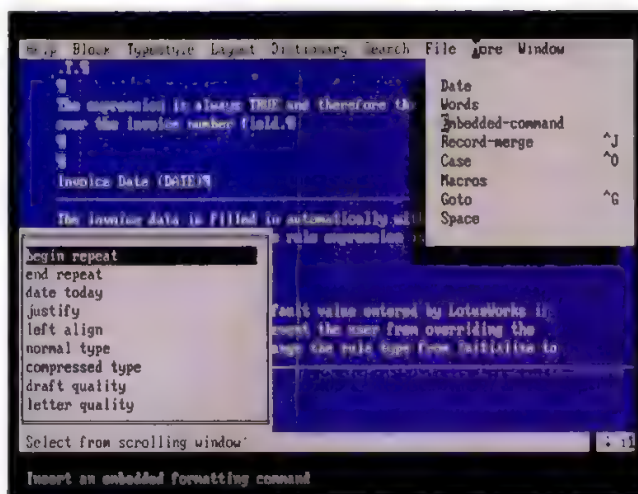
Framework XE's communications module is impressive even without its MHS link. Automatic redial, unattended file transmission, extensive Hayes command support, and baud rates to 38,400 bits per second are standard. It's unfair to call this low-end version of *Framework III* a new product, despite its labeling as Version 1.0. This powerhouse product has room for improvement, but this much functionality right out of the gate can only make for a wise purchase.

LotusWorks

Who would have thought that *Electric Desk*, the first low-end integrated package, would evolve from its humble beginnings in 1986 to star among the latest offerings from Lotus Development Corp.? Marketed as *AlphaWorks* until Alpha Software sold it to Lotus in May 1990, *LotusWorks* was one of two Editors' Choices when *PC Magazine* last evaluated this product category. It remains a worthwhile choice.

Reduced to \$149 to compete with *Microsoft Works*, *LotusWorks*, Version 1.0, offers word processing, database, spread-

SOFTWARE INTEGRATED SOFTWARE



The LotusWorks More command invokes a selection of codes you can insert into your word processing document for printer control that otherwise could not be achieved within the program. Among these commands are IF, ELSE, and ENDIF functions for use in mail-merge.

sheet, graphics, and communications modules. Two features stand out: *LotusWorks'* use of ASCII, .DBF, and .WK1 file formats for the easiest upgrade of any of the programs reviewed, and the ability to retain up to 30 active windows (called "services") in memory at one time.

Except for the database's phone dialer, there are no desktop utilities. According to a Lotus representative, most users have not expressed the need for desktop utilities, so the next version may not offer much more than what is now included. The user interface is well integrated, although it could be improved with shortcut commands and more options for sizing windows. If you're using a mouse, the program makes an annoying beep at boot-up. And most setup changes require you to exit the program and run the separate LWCONFIG program.

NINE OPEN FILES

While much of *LotusWorks'* power is in the database module, the word processor offers some welcome conveniences. You can open nine text files at once, although the maximum file size is only 64K. Two empty blanks greet you in the pull-down Typestyle menu. Here you can enter (via the LWCONFIG utility) the on/off codes for accessing two fonts, printer-resident or otherwise. If your printer or the model it emulates is not supported in the program's set of 150 printers, LWCONFIG also lets you modify a driver or create your own in ASCII format to redirect codes for usual typefaces (bold, underline) to cartridge or downloadable fonts.

Additional fonts and printer-control capabilities come from embedded codes,

which let you chain documents for printing to get around the small file size. Through embedded codes you can also turn justification on and off, set letter-quality type, and send any other control codes your printer recognizes. Embedded IF and ELSE commands assist in mail-merge printing using records that match specified criteria.

Block commands are plentiful, including selection by word, sentence, paragraph, and cursor definition. The maximum block size of about 5.5K, however, may add steps to your file management or formatting. On the up side, you can freely copy or move text as needed or else delete, save to a file, print, or format it. One drawback is the inability to transfer a graph created in the spreadsheet service directly into a word processing document. Instead, you have to embed a command in your word processing document, similar to the approaches used in both *Microsoft Works* and *Eight-in-One*. The difference is that these programs let you position the graphic anywhere on the page, while *LotusWorks* positions the graphic only as a separate page.

STRONGEST DATABASE

LotusWorks' original developers at Alpha Software built some of the functionality of the *Alpha/4* DBMS into the program. *LotusWorks* now has more database functionality than most users will ever need.

The program lets you build data files that are limited only by your disk capacity, and a LOOKUP command will link fields to those of other files. You also can maintain up to nine open files at once



FACT FILE

LotusWorks,

Version 1.0

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.

List Price: \$149.

Requires: 512K RAM (640K recommended), graphics adapter, DOS 2.0 or later.

In Short: Formerly *AlphaWorks*, *LotusWorks* still shines in its database and word processing modules, but the increased selection of packages in this market makes it only one of a few good choices. A new version in development may soon turn heads; watch for it.



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- CompuAdd MS-DOS 4.01
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- One 5.25" and two 3.5" half-height drive bays
- CompuAdd Windows 3.0

\$2245 (66912)



CompuAdd 325

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- CompuAdd Windows 3.0; MS-DOS 4.01

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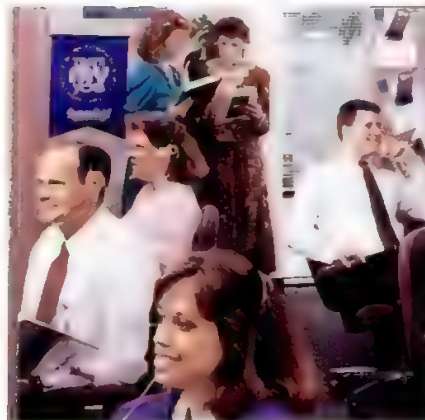
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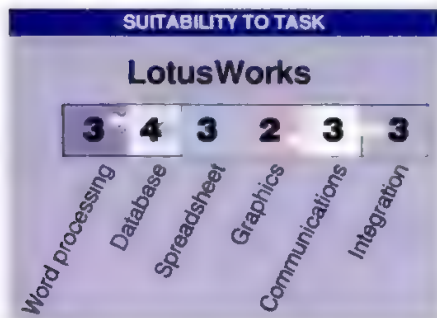
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through *LotusWorks*' support of both expanded and extended memory.

Creating partial and full table views is a breeze in *LotusWorks*. These views are a relational feature also found in *Microsoft Works*, *Framework XE*, *Enable/BP*, and *PFS:First Choice*. You can index up to eight fields and search (via menu or command line) on any number of fields or only across marked records. You can also save search settings to a file for future use.

Other convenient features include memo fields of up to 65,000 characters. The first ten characters of the memo field act as a pointer to the location on-disk of the rest of the field. The remaining data is stored in a separate .DBT file that is not loaded into RAM unless you require it. A special version of the word processor is used for memo field creation and editing.

UNSUPPORTED SPREADSHEET

The spreadsheet is currently the least impressive of the three modules, but this is bound to change under Lotus's auspices. Hidden columns, spreadsheet merges, and defined-range printing are not yet supported. To graph a spreadsheet, your options are limited to line, bar, pie, and x,y graphs. Appearance is aided by a scaling function, grid on/off, and manual legend generation.

LotusWorks offers the largest spreadsheet workspace. (*Eight-in-One* has more rows and columns, but the actual workspace that fits into RAM is smaller.) Its .WK1 format allows easy import and export of files, with the exception of *Lotus 1-2-3* macros, and its selection of 74 spreadsheet-specific functions in all categories is bested only by *Enable/BP*.

LotusWorks' communications function is even more impressive. The two possible open services address modems that are linked to two different serial ports. These services can operate concurrently within the limits of your PC's processor. Automatic redial and several transfer protocols including CRC-Xmodem are

SOFTWARE INTEGRATED SOFTWARE

available for communications sessions.

If you're not impressed with the features of *LotusWorks*, take heart: Lotus Development is reportedly working on a major revamp that's expected to ship soon. And if the improvements are as worthwhile as the vendor is promising, it may be worth buying now and paying only the upgrade price later.

Microsoft Works

Bundled with the IBM PS/1 and other PCs sold for both the home and small-business market, *Microsoft Works*, Version 2.00, is guaranteed to remain a popular choice for a long time. It's easy to see why: This remains the easiest package to learn and use, while still offering plenty of features for \$149.

While a *Microsoft Windows* version has been expected since we last covered integrated software in 1989, *Microsoft Works* is similar in structure to a *Windows* application. The package has a *Windows*-like menu structure, windowing (with up to eight open files), and excellent integration of its word processing, database, spreadsheet with graphics, and communications applications.

Other strengths include *Works*' on-line and printed tutorial, helpful utilities that include a phone dialer, and for laptop users, the ability to fit all but the thesaurus and tutorial onto one 3.5-inch floppy disk.

Microsoft has devoted the most attention to developing the word processor. Complete font support includes special

FACT FILE EDITORS' CHOICE

Microsoft Works, Version 2.00

Microsoft Corp., 1 Microsoft Way, Redmond, WA 98052-6399; 206-882-8080.

List Price: \$149.

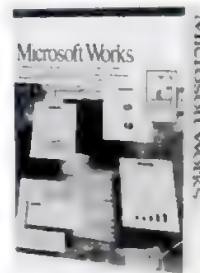
Requires: 512K

RAM, two 5.25-

inch floppy disk drives or one 3.5-inch floppy

disk drive, graphics adapter, DOS 2.0 or later.

In Short: Microsoft has done its homework, delivering remarkable ease of use, a versatile word processor, and smooth data transfer.



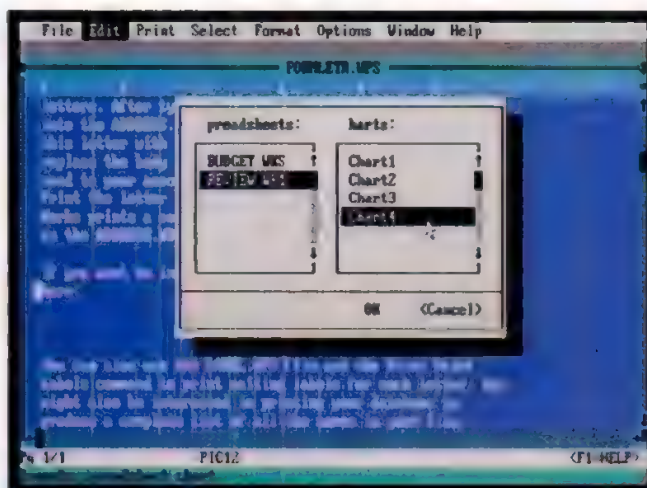
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drivers for a particular printer's font cartridge. Downloadable fonts are set during program setup and can be accessed as you need them.

NO RAM LIMITS

Works does not store word processing files completely in RAM as it does database files, so file size is limited only by disk capacity, and formatting options are numerous. Only *Enable/BP* and *Microsoft Works* allow as many as four tab settings, and only two other packages we evaluated permit variable page length (without forced page breaks) and variable line spacing within one document.

You can also block text for further action, limited only by available RAM. Data transfer from one application to



The Microsoft Works Insert Chart command lets you select any graph created in a spreadsheet that is active in memory for insertion in a document. To insert a spreadsheet itself, you simply select a block, switch windows, and paste it into your text.

TEST PATTERN.



When Multi-Tech modems are put to the test, a pattern emerges.

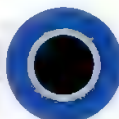
In the 1980's, the dial-up market was dominated by 2400 bps MNP 5th modems. Today, it's 9600 bps modems with V.32/V.42bis. Following that same timetable, PC Magazine awarded our MultiModem224E its EDITORS' CHOICE in May of 1987. In December of 1990, they gave the nod to our MultiModemV32.

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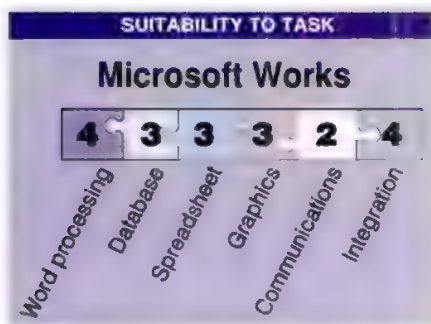
PC Magazine, Vol. 17, No. 20, July/August 1990, 9600 BPS MODEM, Best of the Year Award. PC Magazine, Vol. 17, No. 12, December 1990, 9600 BPS MODEM, Best of the Year Award.

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another is usually as simple as selecting, copying, switching, and pasting. Inserting a graph requires only that the spreadsheet whose data you have graphed is active in memory at the same time. Once you insert the appropriate merge command into the document, you can adjust the graph's height, change its orientation, position it horizontally or vertically, and view it on-screen before printing.

There are certain features you won't find in this version of *Works*, which has not been updated since our evaluation in the fall of 1989. You can't do a word count; a document's status line displays little information; and it does not offer auto-hyphenation, a feature even *Eight-in-One* provides. In addition, corporate features like true footnotes, tables of contents, and indexing are not in the program's repertoire.

In its favor are mouse support with options for graphics-mode operation, conversion to *Microsoft Word* and other formats (available through a \$5 disk purchased separately), an edit Undo command, and visual distinctions among differently enhanced text (WYSIWYG in graphics mode).

ROOM FOR GROWTH

Microsoft Works' spreadsheet module will satisfy new or small-business users and leave room for growth via easy export in .WK1, ASCII, or its native .WKS format. *Works'* 4,096-row by 256-column workspace is not the largest of those evaluated, but 4MB of EMS support help you pack a lot into each file.

While its mediocre count of 56 functions leaves the program behind all other \$149 programs except *Venture*, a welcome sight is a wealth of other commonly needed features. You'll find split windows (as well as the usual *Windows*-like resizing, repositioning, and switching from file to file), fill series (a feature shared by *PFS:First Choice* and *Enable/BP*), and global search.

SOFTWARE INTEGRATED SOFTWARE

If you're importing data, *Lotus 1-2-3's* .WK1 format may cause problems, but only if your file contains string combination operators or other functions that *Works* does not support. Where unsupported operators exist, you can import only the values.

The graphing function is also part of the spreadsheet module. Here *Microsoft Works* stands out as the only package that allows multiple y-axes in a graph. And it's one of three packages that retains dynamic links between spreadsheet and graph. Chart types include hi-lo-close, area, and x,y in addition to the usual pie, line, and column charts. Line/bar combination charts are an option as well.

EMS-SUPPORTED DATABASE

In terms of functionality, *Microsoft Works'* database is the most basic of the three major applications, but many users will never miss what isn't there. The module's main limitation of loading a whole file in

RAM is not a considerable drawback thanks to the same 4MB of EMS support provided by the spreadsheet.

There are plenty of views, including form, table (complete or narrowed by a search), query (criteria are entered onto a blank record), and report. You can define up to eight reports per database file. The package does not index, but you can perform a search on up to three fields at a time.

Mail-merge, as demonstrated in our tests, is a matter of setting up the document with the appropriate merge codes and choosing Print Form Letters from under the Print menu. For our purposes, the merge included only records matching a specific criterion.

When we last reviewed low-end integrated software, vendors like *Enable Software* and *Ashton-Tate* had yet to enter the fray. Today's choices are greater, but *Microsoft Works* remains a formidable presence in the market, and its ease of use has yet to be matched by a package with as much to offer.

THE INTEGRATION OF INTEGRATED SOFTWARE

by Ed Perratore

You can purchase the priciest of the integrated packages evaluated here for a street price of about \$89, but some of them are even better than low-cost: They're free. If you've been shopping for a new PC, you know there is a wide selection of machines competing for your attention, many of them comparably priced and configured. To sweeten the deal, some PC vendors bundle software with their hardware. As you compare machines, you can weigh one bundling deal against another.

Buy any Tandy machine and you

can count on getting *DeskMate*, too. Pick up certain models of IBM's PS/2 line and, depending on the time of year, you may get *LotusWorks*. The most noticeable package deal may be the IBM PS/1, which includes a ROM-based menu routine that lets you select from many packages, including *Prodigy* and *Microsoft Works*.

Several of the integrated packages we evaluated are bundled with PCs from major vendors. Be aware that bundling options change from one model to another, and even from dealer to dealer. They also often change without notice, so be sure to double-check.

DeskMate:
Eight-in-One:

Enable/BP:
LotusWorks:
Microsoft Works:

Personal Office:
PFS:FirstChoice:

Tandy XT- and AT-compatible models.
GoldStar Technology Inc. (XT-compatible model only),
Premier Innovations.
NetworkLand Inc. (four-user network version).
IBM PS/2, Packard-Bell Electronics, Olivetti USA.
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9623	Adobe TypeAlign 1.0 for Windows 69
9874	Adobe TypeAlign 1.0 for Windows & Adobe Type Manager 1.1 for Windows Bundle 125
7928	Adobe Plus Pack 1.0 129
8367	ATM & Plus Pack Bundle 189
7392	Adobe PostScript Cartridge 299
(Entire Adobe Type Library, from 1 to 220 is available. Call for more information.)	
Aldus ... NCP	
8000	Persuasion 2.0 for Windows 339
1332	PageMaker 4.0 499
Alpha Software ... NCP	
5104	Alpha Four 1.1 309
Application Techniques ... NCP	
1214	Pizazz Plus 2.0 69
9621	Picture Ease 1.0 for Windows 99
Ashton-Tate ... NCP	
4450	dBASE IV 1.1 499
Asymetrix ... NCP	
7384	Toolbook 1.0 for Windows 299
Atech Software ... NCP	
9436	Publisher's Powerpak 1.2 for Windows 49
9435	Publisher's Powerpak 2.1 for WordPerfect & Microsoft Word 49



Adobe Systems ... NCP

9874 Adobe TypeAlign 1.0 and ATM 1.1 for Windows Bundle—TypeAlign provides customized text-manipulation with mixed typefaces, styles & sizes. ATM cleans up the jagged or stick figure type. ATM includes 13 scalable fonts. \$125.

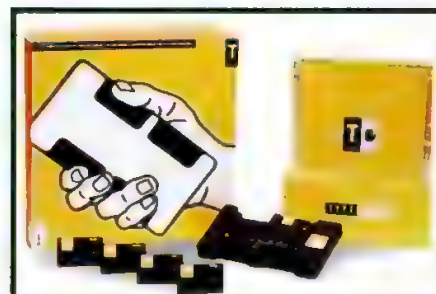
Avery ... NCP	
6006	Label Pro 1.0 (Laser) 49.
7336	Label Pro 1.0 for Dot Matrix 49.
Berkeley Systems ... NCP	
9885	After Dark 1.0 for Windows 29
Better Software ... NCP	
9786	Switch-It 3.23 55.
Bitstream ... NCP	
7568	FaceLift 1.2 for Windows 2 x/3.0 59
8040	FaceLift 1.5 for WordPerfect 5.0/5.1 59.
7569	Companion Value Pack 1.0 125
8883	Type City Cartridge with Deli 259.
	Typeface Packages... each 89.
Borland International ... NCP	
6242	Quattro Pro 3.0 339.
9695	Borland's C++ 2.0 339.
1514	Paradox 3.5 529.
7356	Pascal Pro (2nd Edition) 209.
9635	Object Vision 1.0 call
Broderbund ... NCP	
1416	New Print Shop Companion 33.
1434	New Print Shop 39.
Brown-Wagh ... NCP	
8579	MicroLogic More Fonts 2.0 75.
ButtonWare ... NCP	
6419	PC-File 6.0 89.
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6004	Omnipage 386 3.0 469
8933	Omnipage Professional 1.0 669



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5506 CorelDRAW! 2.0—The PC graphics software that's fast, fun and powerful. CorelDRAW! 2.0 now comes with more drawing power, more type control, and more value...and it's still easy to use \$389.

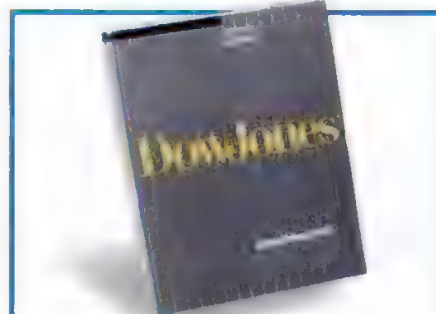
Central Point ... NCP	
5039	PC Tools 7.0 115.
8114	Backup 7.0 (DOS and Windows) 84
9751	AntiVirus 1.0 84.
Checkfree Corporation ... NCP	
6360	Checkfree 3.0 19.
Chronologic Corporation ... NCP	
8849	Instant Recall 1.2 64.
CompuServe	
7546	DOS Membership Kit 1.3 23.
Concentric Data Systems ... NCP	
6575	R & R Relational Report Writer 4.0 159.
Contact Software ... NCP	
1625	ACT! 2.0 229.
Corel Systems ... NCP	
5506	CorelDRAW! 2.0 389
Data Storm ... NCP	
4798	PROCOMM PLUS 2.0 69.
DCA ... NCP	
5611	Crosstalk for Windows 1.1 125.
Delrina Technology ... NCP	
4325	PerFORM 2.1 95.
7351	PerFORMPRO 1.0 (limited time) 159
Digital Research ... NCP	
8288	DR DOS 5.0 145.
9694	DR DOS Upgrade to 5.0 (from any DOS version) 77.



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Dow Jones ... NCP	
6706	Market Manager PLUS 3.0 199.
Fifth Generation Systems ... NCP	
7725	Direct Access 5.1 65.
3950	Fastback Plus 3.0 119.
FormWorx ... NCP	
5810	FormWorx with Fill & File 2.5 85.
9332	Form Publisher for Windows w/Fill & File 109
Fox Software ... NCP	
6188	FoxPro 2.0 (exp. release 6/28/91) 459.
Funk Software ... NCP	
7380	P.D. Queue 1.0 (print spooler) 59.
2228	Sideways 3.3 59.
Geoworks ... NCP	
8789	Ensemble 1.0 129.
Gibson Research ... NCP	
9832	SpinRite II 2.0 64.
Great American Software ... NCP	
9827	Business Value Pack (Money Matters 2.0 & Payroll 2.0) 99.
4880	One Write Plus Acct. Sys. 2.06 189.
Hayes ... NCP	
7983	Smartcom Exec 2.0 79.
9639	LANstep 1.0 349.
hDC Computer Corporation ... NCP	
8974	Icon Designer 1.0 35
7389	Windows Express 3.0 52
7383	First Apps 1.0 52



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7298 ☐ **Hijaak 2.0**—Capture screens & convert graphics files with Hijaak release 2.0. New features include 5K pop-up window, many new raster & vector formats and support for more than 16 Group 3 fax devices. \$99.

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9627 ☐ **Netroom 1.1 (single user)** 52

9628 ☐ **Headroom 2.0** 65.

Hilgraves ... NCP

8204 ☐ **HyperACCESS/5 2.0 (DOS)** 65.

Individual Software ... NCP

6222 ☐ **Resume Maker 1.3** 29.

Inner Media, Inc. ... NCP

8846 ☐ **Wide Angle 1.0 for Windows** 69.

Inset Systems ... NCP

7298 ☐ **Hijaak 2.0** 99.

7300 ☐ **Inset Plus Hijaak** 125.

Insight Development ... NCP

8320 ☐ **PrinTools 1.0** 85.

Insight Resource ... NCP

8851 ☐ **KO-Pilot for WordPerfect 5.1** 55.

Intuit ... NCP

2426 ☐ **Quicken 4.0** 39.

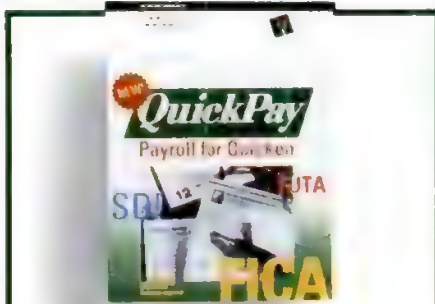
1856 ☐ **QuickPay 1.0** 35.

Isogon ... NCP

7478 ☐ **FontSpace 2.0** 59.

LaserTools ... NCP

6882 ☐ **PrintCache 2.3** 99.



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5417 ☐ **1-2-3 3.1 Plus** 429.

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1852 ☐ **1-2-3 2.3 Upgrade** 95.

1841 ☐ **1-2-3 Upgr. from any ver. to 3.1 Plus** 119.

5799 ☐ **Ami Pro 1.2** 309.

1621 ☐ **Freelance Graphics for DOS 4.0** 329.

MECA ... NCP

2798 ☐ **Managing Your Money 7.0** 99.

Micro Logic ... NCP

6787 ☐ **Info Select 2.0** 95.

Microcom ... NCP

7649 ☐ **Virex-PC 2.0** 79.

6234 ☐ **CarbonCopy Plus 6.0** 119.

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9636 ☐ **Strunk & White Elements of Style 1.0** 35.

7931 ☐ **Random House Encyclopedia 1.0** 68.

Microsoft ... NCP

2894 ☐ **QuickBasic 4.5** 69.

7010 ☐ **Windows 3.0** 99.

7388 ☐ **Project 1.0 for Windows** 459.

7882 ☐ **Productivity Pack 1.0 for Windows** 45.



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2856 ☐ **Excel 3.0 for Windows** 329.

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2853 ☐ **C Compiler 6.0** 329.

1620 ☐ **DOS 5.0 Upgrade** 65.

1624 ☐ **Visual Basic 1.0** 139.

Multisoft ... NCP

4925 ☐ **PC-Kwik Power Pak 2.0** 75.

Nantucket ... NCP

2970 ☐ **Clipper 5.0** 529.

NBI, Inc. ... NCP

9618 ☐ **Legacy 1.1** 289.

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Nolo Press ... NCP

5122 ☐ **For The Record 2.0** 35.

2982 ☐ **WillMaker 4.0** 39.

OCR Systems ... NCP

9879 ☐ **ReadRight 2.01** 309.

9878 ☐ **ReadRight 3.0 for Windows** 309.

Okna ... NCP

9696 ☐ **Desktop Set 3.0 for Windows** 85.

Passport Design ... NCP

1329 ☐ **Encore 2.0** 379.

PC Globe ... NCP

5902 ☐ **PC Globe 4.0** 39.

5900 ☐ **PC USA 2.0** 39.

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9288 ☐ **Laptop Ultravision 2.1 (3 1/2" only)** 49.

4384 ☐ **Ultravision 2.0** 79.

7048 ☐ **Monarch 1.0** 319.

PowerUp ... NCP

7860 ☐ **Calendar Creator Plus 4.0** 45.

7861 ☐ **Address Book Plus 3.0** 49.

7857 ☐ **Labels Unlimited 3.0** 49.

7858 ☐ **Express Publisher 2.0** 89.

Precision Software ... NCP

6600 ☐ **Superbase 4 for Windows 1.2** 429.

Qualitas ... NCP

7539 ☐ **386MAX 5.1** 75.

7967 ☐ **BlueMAX 5.1 for PS/2 (3 1/2" only)** 85.

Quartermaster ... NCP

6422 ☐ **QRAM 1.0** 54.

3221 ☐ **Expanded Memory Mgr. 386 5.1** 65.

3220 ☐ **DESQView 2.3** 85.

4586 ☐ **DESQView 386 2.3** 145.

QUE Software ... NCP

4155 ☐ **RightWriter 4.0** 54.

1857 ☐ **RightWriter 4.0 Network** 169.

Reality Technologies ... NCP

7891 ☐ **WealthStarter 1.0** 39.

6572 ☐ **WealthBuilder 1.1** 99.

Reference Software ... NCP

4396 ☐ **Grammatik IV 2.0** 59.

7483 ☐ **Grammatik for Windows 2.0** 59.

Revolution Software ... NCP

4480 ☐ **VGA Dimmer 3.0 (screen saver)** 29.

Roykore ... NCP

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Sitka ... NCP

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3720 ☐ **Flashcard 2.1 (AppleTalk network card)** 155.

7330 ☐ **Flashcard MicroChannel** 219.

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3542	Softlogic Solutions ... NCP	
	☐ Software Carousel 5.0.	55.
3496	Software Publishing ... NCP	
	☐ Professional Write 2.2.	169.
9638	☐ Professional Write Plus 1.0.	175.
3482	☐ Harvard Graphics 3.0 (limited time) .	359.
7977	Solution Systems ... NCP	
	☐ Briel 3.1 (Programmer's Editor) .	189.
	Spinnaker ... NCP	
1415	☐ PFS: WindowWorks 1.0.	129.
7604	☐ PLUS for Windows 2.0.	289.
	Stac Electronics ... NCP	
1409	☐ Stackster 1.1.	89.
	Symantec ... NCP	
6397	☐ The Norton Backup 1.2.	105.
3146	☐ The Norton Utilities 6.0.	119.
3425	☐ Q&A 4.0.	239.
7999	☐ Norton Anti-Virus 1.0.	89.
	Systems Compatibility ... NCP	
9046	☐ Complete Writer's Toolkit 1.0.	85.
8215	☐ Outside In 2.0.	85.
6564	☐ Software Bridge 5.0.	79.
	Teleware ... NCP	
9847	☐ M.Y.O.B. for Windows.	139.
	TIMESLIPS ... NCP	
2987	☐ Timeslips III 4.0.	195.
6994	☐ PercentEdge 1.0.	69.
1270	☐ TimeSheet Pro 2.0.	145.
	Timeworks ... NCP	
6253	☐ Publish-It! 2.0.	139.



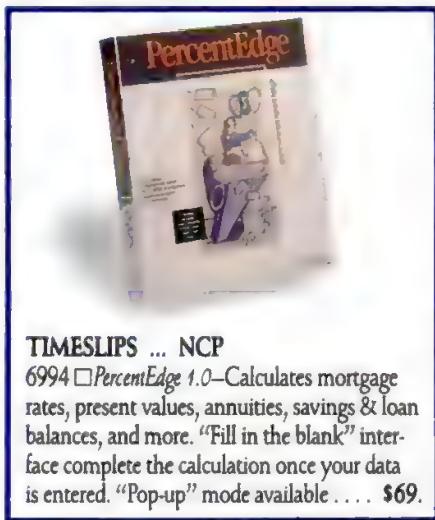
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3221 ☐ Expanded Memory Manager 386 5.1—Finds up to 200K of "hidden" memory in your PC and manages Expanded or Extended memory. A must-have for memory-hungry software, networks or Windows 3.0 ... \$65.

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1051	☐ Color Graphics Presentation 1.0.	\$95.
	☐ ClickArt (EPS and Bitmap available) .	call
	Touchstone Software ... NCP	
7420	☐ Check It 3.0.	89.
	Traveling Software ... NCP	
5179	☐ LapLink III 3.0.	95.
	West Lake Data Corporation ... NCP	
7577	☐ PC-FullBak + 2.0.	52.
	WordPerfect Corporation ... NCP	
7781	☐ LetterPerfect 1.0.	129.
3804	☐ WordPerfect 5.1.	265.
6685	☐ DrawPerfect 1.1.	279.
	WordStar International ... NCP	
1482	☐ Correct Grammar 1.0 for Windows.	65.
6791	☐ WordStar Professional 6.0.	199.
	XTREE ... NCP	
6161	☐ XTree Gold 2.0.	95.
	Z-Soft ... NCP	
1626	☐ Publisher's Paintbrush for Windows.	299.

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	Broderbund ... CP	
8068	☐ Where in the World is Carmen	
	San Diego Deluxe Edition.	52.
5851	☐ SimCity.	33.
8886	☐ SimEarth.	45.



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6994 ☐ PercentEdge 1.0—Calculates mortgage rates, present values, annuities, savings & loan balances, and more. "Fill in the blank" interface complete the calculation once your data is entered. "Pop-up" mode available. \$69.

	Electronic Arts ... NCP	
4534	☐ Mavis Beacon Teaches Typing 1.0 (CP).	35.
7865	☐ PGA Golf.	35.
	Harvard Associates ... NCP	
2324	☐ BPC Logo 3.0.	59.
	HyperGlot Software ... NCP	
	(French, German, Italian, Spanish available.)	
	☐ Word Torture for Windows. ea.	34.
	☐ Word Torture 3.0. ea.	29.
	Microsoft ... NCP	
7881	☐ Entertainment Pack for Windows 1.0.	29.
2858	☐ Flight Simulator 4.0.	39.
8270	☐ Aircraft and Scenery Designer 1.0.	29.
	Microsoft Press (Books)	
8129	Running Windows (2nd Edition)	22.
8136	Running Microsoft Excel.	22.
	Penton Overseas ... NCP	
	☐ Vocabulary Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) . each	35.
	Sierra ... CP	
9466	☐ Space Quest IV (VGA).	39.
7972	☐ King's Quest V (VGA).	45.
	SirTech. ... CP	
8235	☐ Bane of the Cosmic Forge.	39.
	Software Toolworks ... NCP	
4659	☐ Chessmaster 2100 (CP).	35.
7372	☐ World Atlas.	42.



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7649 ☐ Virex-PC 2.0—Powerful, comprehensive solution to DOS-based computer viruses. Featuring: MiniScan TSR for continuous virus protection, Windows & Network compatible, less than 1K & detects over 450 viruses. \$79.

3467	Spectrum Holobyte ... NCP	
	☐ Tetris.	22.
	Stone & Associates ... NCP	
5231	☐ Phonics Plus 1.1.	22.
3439	☐ 2nd Math 4.2.	27.
	Toyogo ... NCP	
7674	☐ Nemesis Go Master 4.7.	41.
7676	☐ Nemesis Go Master Deluxe 4.7.	88.
	True BASIC, Inc. ... NCP	
	☐ Kemeny/Kurtz Math Series. each	45.

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6747	Safe 400S.	399.
	American Power ... 2 years	
7108	Smart UPS 400.	339.
7105	Smart UPS 600.	469.
6811	Back-UPS 360.	219.
7106	Back-UPS 520.	329.
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1299	SixPakPlus 384K Ct/S/P.	179.
8041	SixPak 286 0k.	99.
	ATI Technologies ... 2 years	
9821	VGA Basic-16 (640 x 480, 16 colors) .	85.
9985	VGA Integra (1024 x 768, 64 colors) .	129.
9629	VGA Wonder XL (256K upgradable to 1MB) 199	
9619	Ultra/8514 Graphics Card (512K) (req. VGA) 419.	
1825	2400ctc/i Modem (w/9600 SendFax) .	139.
9620	9600ctc/e Modem.	379.
	Avery ... 90 days	
1601	1st Impression First Pack.	57.
1600	Avery 1st Impression.	229.
	Boca Research ... 5 years	
7001	BOCARAM/AT PLUS (0-8 Meg)	119.
7061	BOCARAM/XT OK (0-2 Meg, LIM 4.0) .	99.
6998	I/O Board for AT.	59.
6999	I/O Board for Microchannel (S/S/P).	109.
8380	BasicVGA (256K, 640 x 480) .	69.
8381	SuperVGA (1 Meg, 1024 x 768) .	145.
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7400	2 Position Laser Compatible Switch Box.	109.
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8578	Creative Labs Sound Blaster.	159.
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7894	BJ-10e Printer with free case (4.6 lb.) .	329.
7897	BubbleJet Ink Cartridge (BJ-10e) .	23.
9037	BJ-300 Printer (80 column) .	549.
9038	BJ-330 Printer (136 column) .	649.
7896	BJ-10e Sheet Feeder.	75.
9828	BubbleJet Ink Cartridge (BJ-300 & BJ-330) 26.	
	CH Products ... 1 year	
7801	FlightStick w/Falcon.	49.
7345	Rollermouse (Trackball) serial. bus.	99.

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6791 WordStar Professional v2—Version 6.0 incorporates pull down menus, page preview and more. ... \$199.
1432 Correct Grammar for Windows—Works with any Windows application... 65.

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1418 AddressWriter Envelope Printer 469.
1812 LabelWriter II Printer 195.

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1708 Ruby-Plus SPF-2+ 65.
7358 Command Center SPF-4 89.
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9876 FasMath 83D87-33 439.
9877 FasMath 83S87-16 (SX compatible) 219.

Datadesk ... 3 years
6901 Switchboard 159

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1904 FX-1050 (136 col., 264 cps, 9 pin) call
5183 LQ-510 (80 col., 180 cps, 24 pin) call
1930 LQ-850 (80 col., 264 cps, 24 pin) call
1917 LQ-1050 (136 col., 264 cps, 24 pin) call
5184 LX-810 (80 col., 180 cps, 9 pin) 185.

Everex ... 1 year
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Hauppauge Computer ... 1 year

9031 20 MHz 386 Motherboard for PC 995.
9032 20 MHz 386 Motherboard for XT 995.
9870 25 MHz 386 Motherboard for AT 1099.
9034 33 MHz 386 Motherboard for AT 1339.

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7391 Ultra 9600 Modem (\$150 rebate till 8/18) 669.
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Hewlett-Packard ... 1 year
9993 LaserJet IIIP (with toner) 1149.
6754 LaserJet III (with toner) 1699.

Hitachi ... 2 years
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9491 CM2085M 20" SVGA Monitor (1280 x 1024) 1995.

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6421 2400B MNP Internal Modem 199.
5119 2400 Baud External Modem 179.
6420 2400EX MNP Modem 229.
7880 9600EX Modem 549.
2346 Inboard 386/PC with 1 Meg 495.
5336 Above Board Plus 8 2 Meg 449.
5342 Above Board Plus 8 I/O 2 Meg 479.

7782 SatisFAXtion (fax board) \$399.
8778 SatisFAXtion for Microchannel 449.
8901 Matched Memory 2 Meg (PS/2) 139.
8903 Matched Memory 4 Meg (PS/2) 299.
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1810 1 Meg 99. 1787 2 Meg 299.

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4750 80387SX (16 MHz 80386SX CPU's) 309.
2372 80387-20 (20 MHz 80386 CPU's) 399.
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2582 Master Piece Plus 99.
7899 Expert Mouse serial 119. 7900 bus 129.

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4518 101 Plus Keyboard 99.

Kraft ... 5 years
5800 3 button Thunder Joystick 29.
7862 TopTrak (Laptop Trackball) 75.

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1484 ScanMan 32 169.

7975 ScanMan 256 319.
8694 MouseMan (serial) 69. 9766 (cordless) 139.

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1196 T224 2400 Modem (for Toshiba Laptops) 129.
1187 T324FM 96/24 Fax Modem (Toshiba Laptops) 299.



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Matched Memory—Increase your LaserJet IIP, III, IIID, or IIIP memory. Easy installation & better performance make these an obvious choice.
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1787 Matched Memory (2 Meg Module) 159.

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7595 2 Meg Expansion for HP LaserJet IIP or III 119.

7012 Memory Upgrade PS/2 70 - 2 Meg 139.

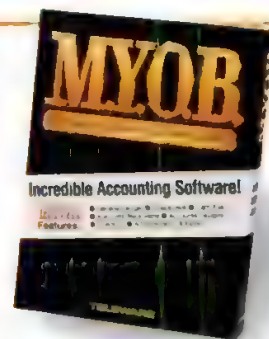
Microsoft ... lifetime
7597 Microsoft Mouse 89.
2897 Mouse with Paintbrush 105.
2898 Mouse with Windows 3.0 149.

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PC-TRAC Trackball
6007 serial 75. 6008 bus 89.

7271 Inport 79. 6330 PS/2 79.

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3200 Silencer 150 (84% noise reduction) 115.

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8975 Complete Font Library (for LJ/III) 275.

7055 Memory upgrade for LaserJet IIP/III: 2 Meg 149 7759 4 Meg 259.
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6838 2 Meg 249. 6836 4 Meg 379.



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3102	2400 Baud External Modem	179
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4542	2400 Baud Internal Modem for PS/2	229
8132	PM2400 Pocket Modem	109
7934	PM9600SA Modem	489
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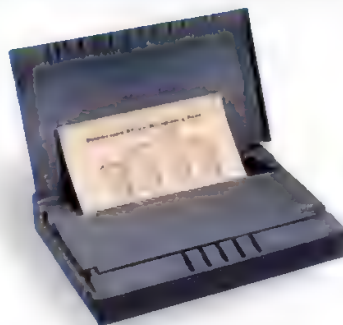
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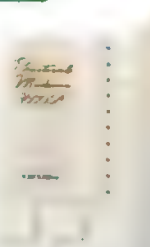
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2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13
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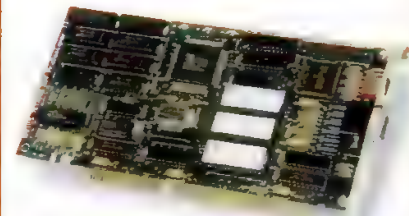
3291	5 1/4" DS/DD 360k Disks (Qty. 10)	8
3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	11
3298	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	18
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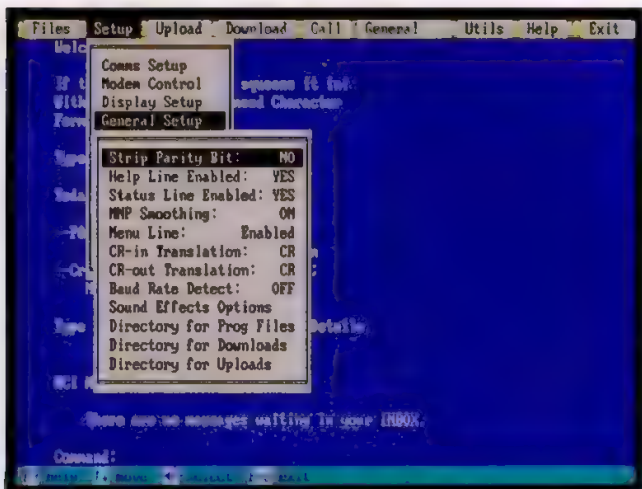
Personal Office

Many integrated packages are equipped with generous export capabilities to address the concerns of users who fear outgrowing a low-end product. The \$79.95 *Personal Office*, Version 4.0, from Top Ten Software is designed for a different crowd: the home or small-business user who doesn't expect his or her needs to change much at all. Anyone wanting to advance beyond this program will find ASCII export the only way out of it.

Personal Office does have its strengths. It has a wide range of communications options, and its desktop utilities are more abundant than *Eight-in-One*'s. *Personal Office* falls short of *DeskMate* and *Eight-in-One* in embracing new users. Documentation is sketchy and includes a tutorial that prompts you to hit Tab repeatedly to center lines even though the program supports centering. Press F9 for help, and you'll get a brief rundown of each command without more-thorough instructions.

UNPOLISHED INTERFACE

Personal Office's word processing module offers the most functionality after the communications facility, but it remains comparatively limited. Within a file size limited only by RAM, you can merge files, count words, autoload files (as in other modules), enhance text through a variety of attributes (including combined attributes), and access up to two monospaced cartridge fonts in addition to printer-based fonts. Printer support is limited to classes rather than models, but you can edit your driver if you need finer control over enhancements.



The general setup menu in *Personal Office*'s communications module offers a wide range of options for setup, file transfer, and session automation. It's the program's strongest module—comparable to that of any standalone communications program.

SOFTWARE

INTEGRATED SOFTWARE



FACT FILE

Personal Office, Version 4.0

Top Ten Software, 40308 Greenwood Way, P.O. Box 1450, Oakhurst, CA 93644; 209-683-7577.

List Price: \$79.95.

Requires: 512K RAM, graphics adapter, DOS 2.0 or later.

In Short: Except for its powerful communications module and great selection of desktop utilities, *Personal Office* remains a low-end product for the permanent low-end user. Additional import/export options would greatly enhance this package.



CIRCLE 406 ON READER SERVICE CARD

Personal Office's interface is awkward, but it does offer a selection of intuitive key combinations to shorten the path to certain functions. To retrieve a file from a disk or drive other than the default, you must select F8 for the Utilities pull-down menu, set the appropriate data path, and then choose Load File from the Files menu or hit Alt-L. The spell-checker works only on whole documents, and the program displays all questionable words in a seven-line window. You must hit F8 when you're ready to see the flagged words in each successive seven lines of your document.

Unfortunately, data transfer among modules is more limited in *Personal Office* than in any of the other packages we

evaluated. From text file to text file, you must save a block of text, load the destination file, and merge in the saved file. You must print spreadsheet data to a file before you merge it, and except for mail-merge, you cannot transfer data from the database to the word processor or to any other module or export format for that matter.

STARTER SPREADSHEET

Spreadsheet and database functionality is limited to the needs of new users, and the 52-column workspace, arranged from A to Z and then lowercase a to z, is only slightly less confusing than *Venture*'s arrangement of naming rows and columns by number. While certain helpful features like cell protection, multiple copying of a single block, fixed titles, and manual recalculation are available, the lack of many common features weakens the package.

Cell formatting, for example, is limited to setting the number of decimal places and toggling +/- display. There is no support for comma, currency, or other numeric formats. *Personal Office* will print a defined range, but you must input starting and ending cells into a query window. And you cannot anchor your range using the cursor keys.

Personal Office's database module is also checkered by limited functionality. Except for a print-to-file feature, the lack of import/export facilities marks the spreadsheet and database, and comma-delimited format is not available when printing records to a file. When we tried to mail-merge selected records into a form letter, we had to tag the records matching the search criterion, then save these records to a separate file for use in the actual merge procedure.

The word processor gives you the choice of merging database fields "compressed" (data only) or "full" (including spaces to fill out the full length of a field), but when we merged all numeric fields "compressed," they printed with several blank spaces preceding them on their respective lines on the page.

COMM MODULE STANDS OUT

Personal Office shines in its communications module. Redial requires a key combination, but an extensive script language eases unattended file transmission and other functions. MNP support (including Class 5's Date Phase Optimization), two text editors, host mode, data transfer rates up to 115,200 bits per second, and several transfer protocols come standard.

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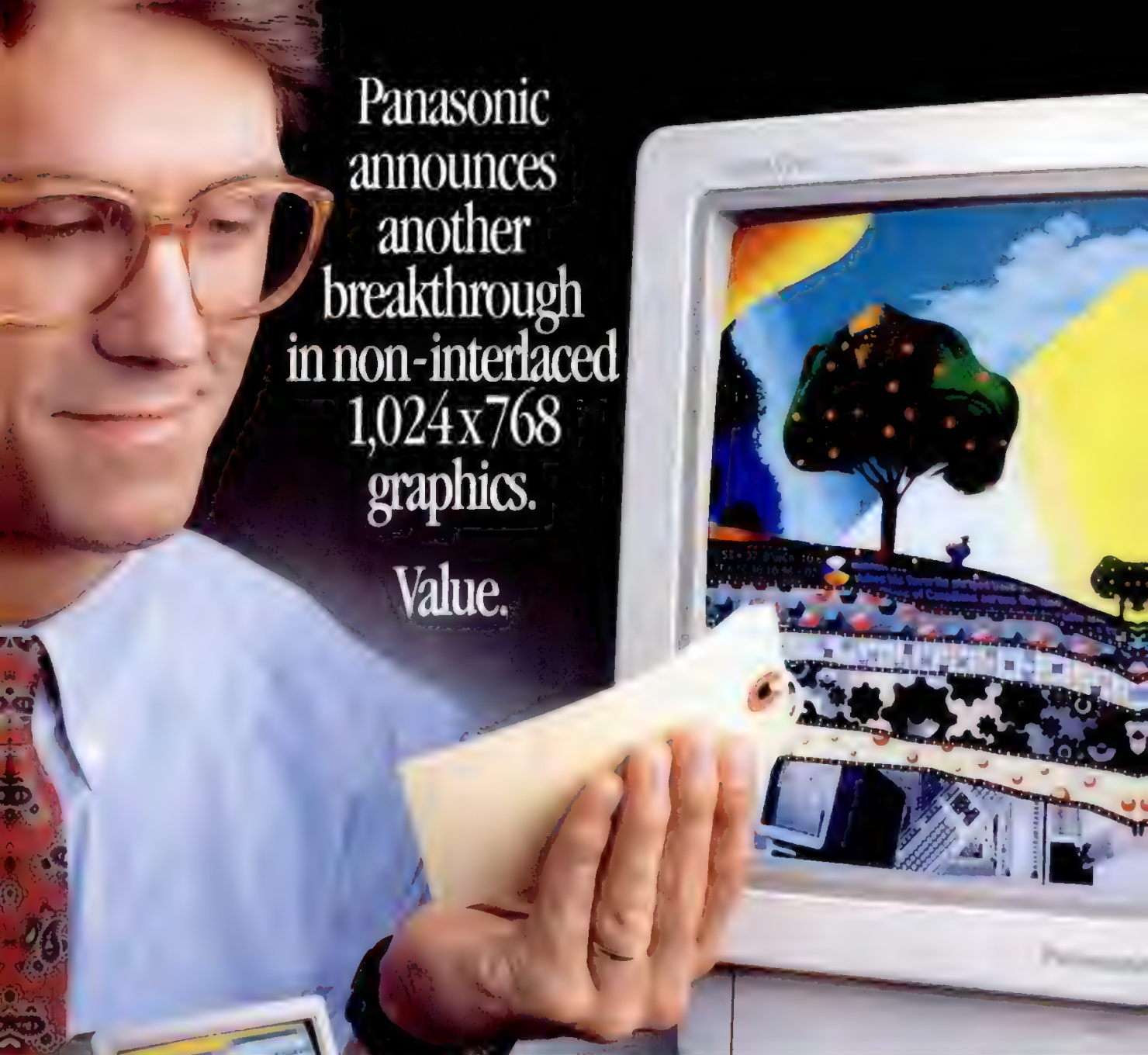
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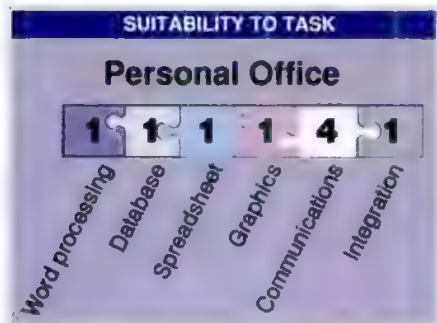
*MAC II is a registered trademark of Apple Computer, Inc.
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SOFTWARE INTEGRATED SOFTWARE



Despite the power of *Personal Office's* communications module, the package faces some tough competition against programs like Spinnaker's low-cost *Eight-in-One*—particularly in the light of its lack of data export facilities. Considering the competition in the low-end market, Top Ten Software has some work to do before its package becomes a contender.

PFS:First Choice

Ask any PC user to name a trustworthy software line and you will hear the initials PFS. Software Publishing Corp. recently sold most of its well-known PFS line, including *PFS:First Choice*, to Spinnaker Software Corp. Now priced at \$149, *PFS:First Choice* ranks high for ease of use; its clean interface and documentation are first-rate, the word processor holds its own, and the graphing module's export capability to Software Publishing Corp.'s *Harvard Graphics* is impressive for a low-end package.

The program primarily falls short in its spreadsheet and database modules. For its price, the package offers a selection of functions that is sometimes pleasing but too often disappointing.

CLEAN PRESENTATION

New users will find *PFS:First Choice's* presentation a welcome sight. You're greeted with a crisp main menu where you create and retrieve files, set up the program, and access communications functions. Highlight your choice or strike its corresponding number and the selection blinks in confirmation as the program executes the command.

The program's file-handling features are notable, too. Without exiting to DOS, you can perform the most common functions and can even add RAM-hungry

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SOFTWARE INTEGRATED SOFTWARE

standalone programs to the main menu. *PFS:First Choice* uses a mere 4K of RAM, while the rest is swapped out to give room to the other application.

A word processor conversion disk, supplied free to registered users, converts formats from *WordPerfect*, *Word*, and other major programs. *First Choice's* word processor, though, will be enough for many users. Within a maximum file size of 64K, the module includes many options.

Among your choices, for instance, you can Alt-key your way to blocking text—copying, moving, or saving it—and invoking the calculator, one of the two desktop utilities available. You use Alt-B to boldface a block and Alt-C to copy, but not all the key combinations are intuitive. And any enhanced text, even text with a doubling up of bold and italic, is displayed in the same color regardless of the two color palettes you use.

Since *PFS:First Choice* holds only one file at a time in RAM, you use the clipboard for moving or copying text to and from a word processing file, to and from the spreadsheet, or from the database or graphics modules. The clipboard proved both efficient and easy to use in creating our mail-merged test document, which contained a merged spreadsheet and graph. Although you cannot use the clipboard freely across all applications, in this common procedure it was a pleasure to use.

The program does have its limitations. The word processor's 75,000-word spelling dictionary is smaller than programs costing less than half the price. You cannot use wildcards in the search-and-replace function, nor perform case-sensi-



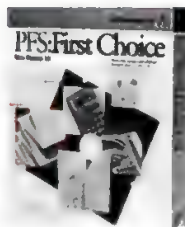
FACT FILE

PFS:First Choice, Version 3.11
Spinnaker Software Corp.,
One Kendall Square,
Cambridge, MA 02139;
800-826-0706, 617-494-1200.

List Price: \$149.

Requires: 512K RAM, graphics adapter, DOS 2.1 or later.

In Short: An adequate word processor and a crisp, easy-to-use interface help explain the popularity of *PFS:First Choice*. Weak spreadsheet and database modules, however, hurt the product's chances at being a truly good buy.

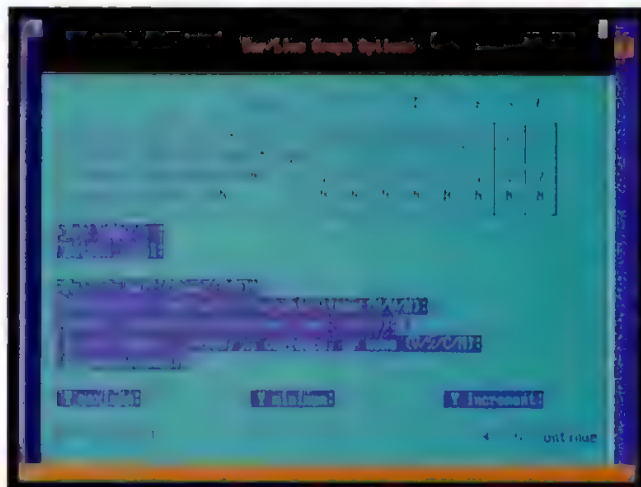


CIRCLE 407 ON READER SERVICE CARD

tive searches. As with the lowest-end packages of this batch, variable page length is available only through hard page breaks.

Fortunately, the word processing module does have strengths. If a printer feature you want isn't listed in the Style pull-down menu, you can embed codes in your document to send a command directly to your printer. This helps you use cartridge and downloadable fonts as well as printer-resident fonts. It's also the procedure for joining text files for printing (bypassing the 64K file-size limit) and embedding graphs in your document.

First Choice's interface structure is consistent throughout the program, but the breadth of commands is not. The program's spreadsheet module falls short of virtually all equally priced competitors.



Some of the graphing options available within the *PFS:First Choice* spreadsheet module are shown here. You can readily export graphs to *Harvard Graphics* or other standalone presentation graphics packages.

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Maximum Data Throughput (bps)	38,400	19,200	9600	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800
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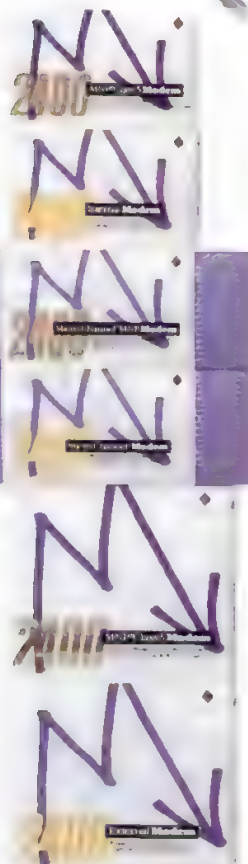


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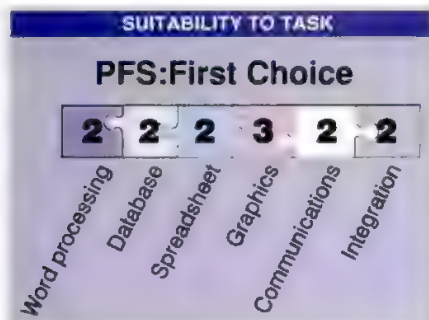
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SPREADSHEET AND DATABASE LIMITATIONS

The module's 1,024-row by 768-column spreadsheet size, which is available only to 640K-equipped PCs, does have a few good functions to its credit. A Quick Entry feature lets you duplicate the last cell typed or perform a data fill by succession of numbers, days, months, quarters, and more. Other pluses include a total of 72 functions, as well as import/export to ASCII, Lotus 1-2-3, and PFS:Professional Plan.

Unfortunately, the spreadsheet lacks any kind of sorting, named ranges, hidden columns, cell protection, and spreadsheet merge. If you try to copy data to and

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from the database, you'll find it works only one cell at a time. And you can perform only global adjustments to column width.

The database is also limited, but in general, it serves well enough for low-end use. All the common data field types are available except currency. The maximum sizes of fields and records won't deter buyers, although a maximum of 250 records per file may. The program's record creation is straightforward, and ASCII import is easy. You can't join data files or copy data from the word processor unless you first export the delimited file to ASCII.

CREATING SLIDE SHOWS

The main attraction of PFS:First Choice's graphing function is its ability to create slide shows from text files created in the word processor. There are also additional fonts available for use in slide shows. Along with the text charts, the package includes the usual column, pie, and line graphs plus area and combination charts. You can export the graphs to other PFS

packages as well as to *Harvard Graphics*. Graphing is available in the spreadsheet as well as in the standalone graphing module.

Despite its weaknesses and the inroads made by the competition, PFS:First Choice remains a favorite and is bound to remain so for new users. Under Spinnaker's direction, perhaps future versions of this already popular package will give other vendors something to think about.

Venture

Intended primarily as a guide for the entrepreneur who plans, analyzes, or manages a small business, Star Software Systems's \$149 *Venture*, Version 2.0, is distinct from the other packages we evaluated. While *Venture* is priced competitively with several of the other integrated packages, Star has focused its greatest efforts on modules that none of the other packages offer: a feasibility planner, business planner, and general ledger.

The word processor (Write), spreadsheet (Calc), database (File), graph mod-

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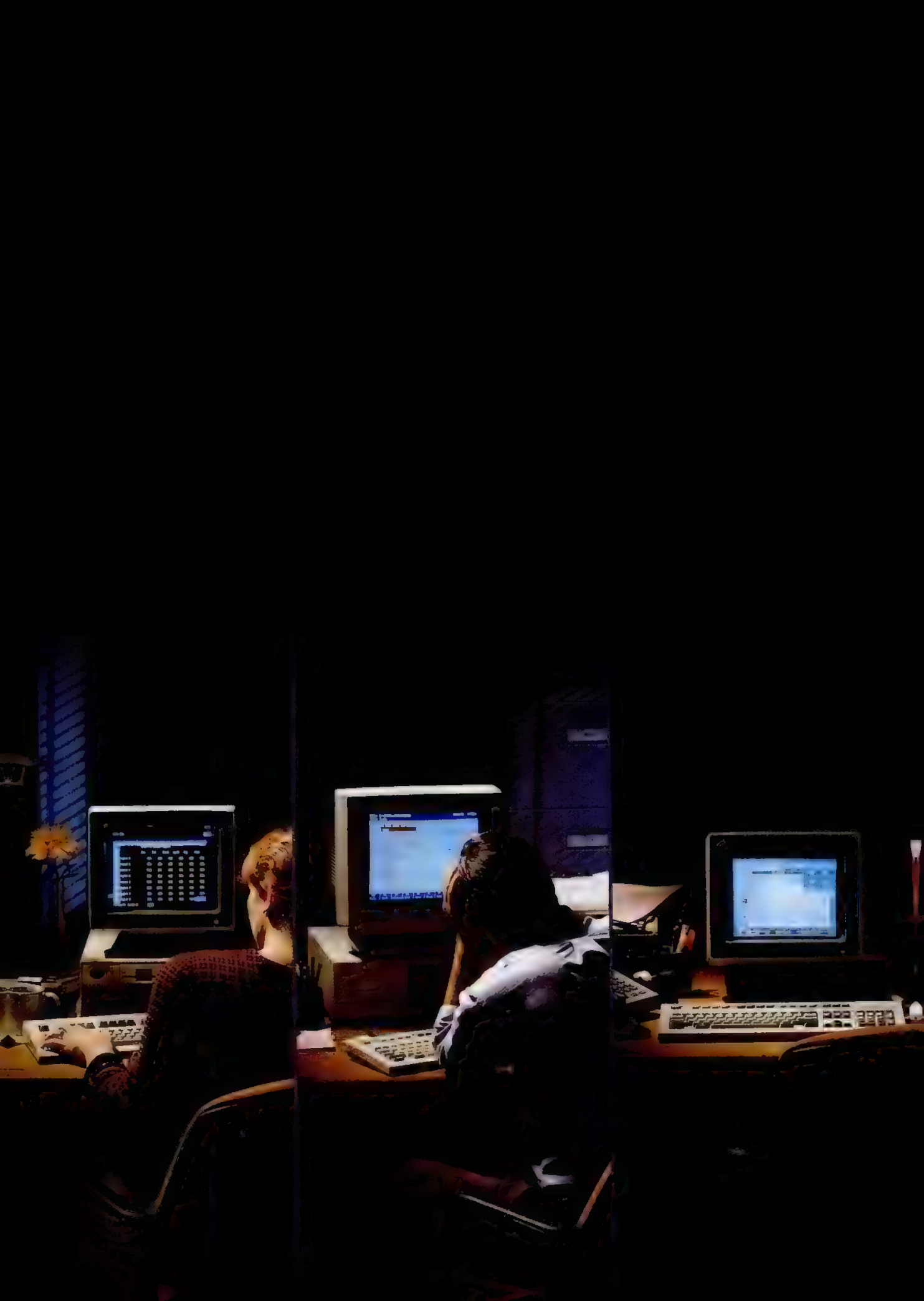
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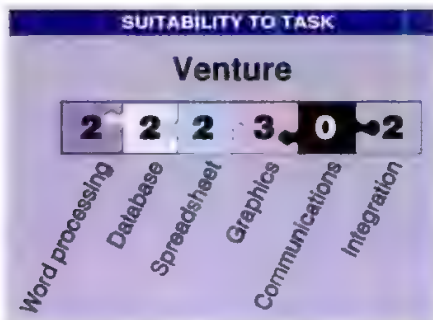
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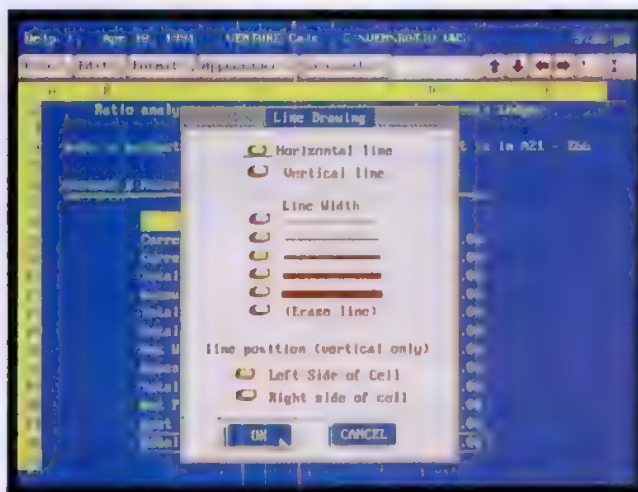




ule (Business Graphs), and outliner are integrated with the others under Tandy's *DeskMate* operating environment. The program does not include a communications module or any desktop utilities. *Venture* is sold directly by Star Software Systems or through Tandy's Radio Shack outlets, as are other *DeskMate*-based software packages.

Venture's limitations begin with its operation under the *DeskMate* environment. Unfortunately, the task-switching ability of the *DeskMate* integrated package has not been made available for other programs running under the environment. Other strengths and weaknesses are *Venture*'s own.

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In addition to file linking, *Venture*'s spreadsheet module offers presentation features not available in the other packages reviewed here. You can enhance the look of your spreadsheet with patterns, boxes, and lines.

ENTREPRENEUR'S GUIDE

No business meets with success unless management has asked itself—and satisfactorily answered—some hard questions about the business concept, the product, its production, the competition, feasibility, means of marketing and financing, growth, and other business plan variables. *Venture*'s business and financial planning

modules help you frame answers to questions and provoke critical thinking.

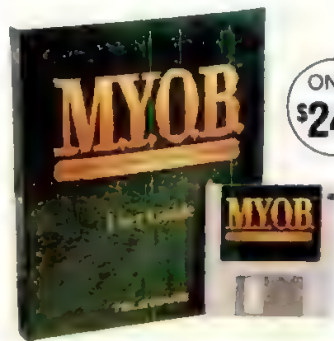
You can transfer information gathered in the Planner to ASCII or to *Venture*'s word processing module. Once in the word processor, you open the file as you would any other. Most other transfers between modules are more direct than this import/export method. You define a block, cut or

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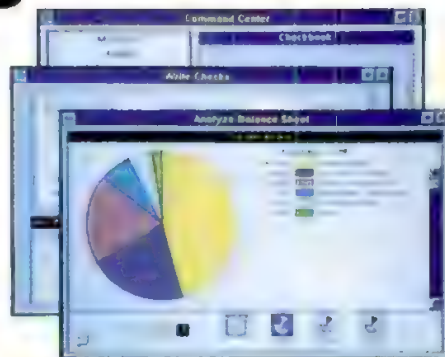
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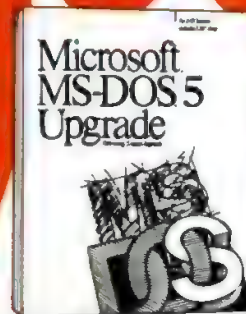
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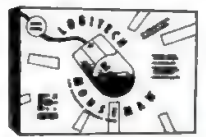


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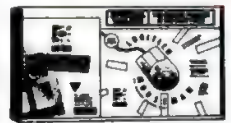


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cessor's format or in ASCII—into the database, and database searches can encompass all fields.

Another of *Venture's* helpful features is the ability to enter more data into a field than your field size would otherwise allow. This is handy for entering long names, addresses, and other information that occasionally runs beyond your projections.

GENEROUS SPREADSHEET WORKSPACE

Perhaps the most powerful of *Venture's* standard modules is its spreadsheet. The 999-row by 255-column workspace is a reasonable range for most uses, providing more total cells than *Framework XE* and *Enable/BP* combined, and file linking extends that capability even further. Cell protection, hidden columns, and spreadsheet merge (via cut-and-paste) are other helpful features.

Unlike *DeskMate's* spreadsheet module, *Venture* allows import/export to *Lotus 1-2-3's* .WK1 format. Considering the business focus of this package, you may find it convenient to shell out to 1-2-3 through *Venture's* Run command. If you do, keep in mind that *Venture* supports only 35 spreadsheet functions. Although other packages provide even less support, this is still low.

Aside from file linking, another surprise you'll find in *Venture's* spreadsheet is the ability to draw boxes and shaded areas on the printed spreadsheet, a unique ability among the packages we evaluated. You can select 20 different shade patterns and select areas globally or by row or column.

Venture's Business Graphs module, also sold separately for \$24.95 as the *DeskMate Business Graphs Companion*, lets you simultaneously compare graphs you create in up to ten displayable windows that you can size and position. Charting functions include bar, pie, and line graphs as well as x,y and combination line and bar graphs.

Clearly, *Venture* isn't for everyone. If you want a general-use integrated package, you can do a lot better for the price. For entrepreneurs who want to plan and maintain a business venture in the most methodical way, *Venture* has lot to offer.

Ed Perratore is a frequent contributor to PC Magazine.

FACT FILE

Venture,
Version 2.0
Star Software
Systems, 363 Van
Ness Way,
Torrance, CA
90501; 800-242-
7827, 213-533-
1190.

List Price: \$149.

Requires: 512K RAM (384K for Tandy-based PC), graphics adapter, DOS 3.0 or later. Mouse recommended.

In Short: Don't buy *Venture* for its general integrated applications; weaknesses abound. The product's strengths are in the planning, analysis, and maintenance of a small business. No other product in this roundup comes close to those benefits.



CIRCLE 408 ON READER SERVICE CARD

copy, open a new or existing file, and paste.

Venture's General Ledger provides additional business-management capabilities, including a double-entry system that also lets you write and print checks. Template charts are provided for use in your own business.

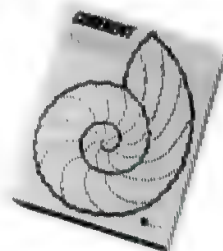
STANDARD FEATURES LIMITED

Venture offers ample functionality through these modules alone, but it falls short where it competes with the other general-use integrated packages. Still, the standard modules do provide some useful features. The word processor is similar to the one in *DeskMate*, but in *Venture*, document size is limited by RAM rather than preset at 50K. You cannot bring graphics into a document, although you can export graphs to *DeskMate's* word processing or paint module. *Venture* provides an outliner, while *DeskMate* offers an outliner only as a \$19.95 companion program. There is no thesaurus or macro facility, but you can buy the *DeskMate Companion* products for these features.

The most significant differences in these programs' word processors are mail-merge and mailing-label creation. For *DeskMate*, the limited address book provides both these services. *Venture's* File module, while limited in some ways, is more useful to small-business users.

If you want to work with a table view of your records, you can cut and paste data records from the database to the spreadsheet, then back again. You can paste comma-delimited text—in the word pro-

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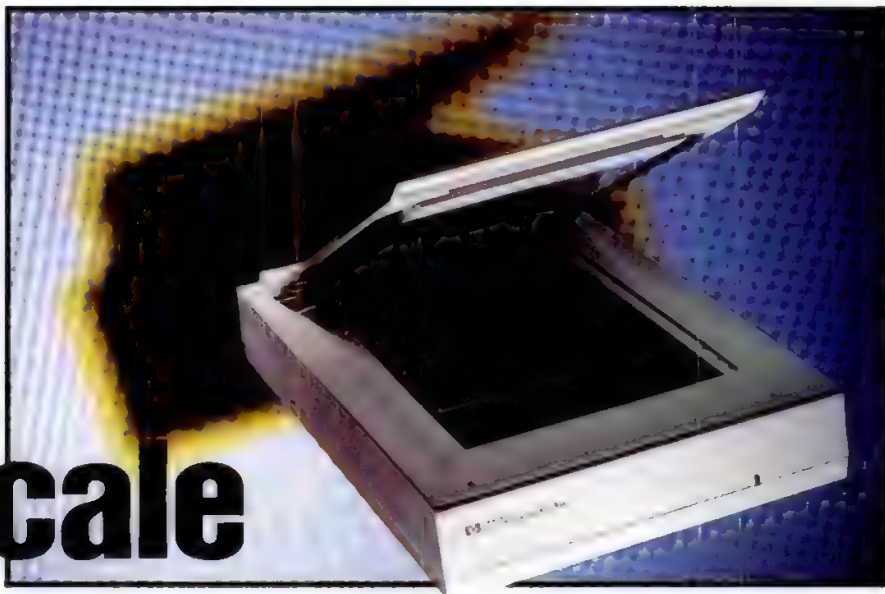
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**Whether for corporate
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recognition, today's low-cost
high-performance desktop
page scanners are a versatile
solution for a variety of
ordinary needs.**

by Greg Pastrick

At one time, the high cost of desktop scanners restricted them to the specialized arena of the publishing community. Yet as their hardware capabilities have grown, so too has user interest. Scanner technology has now reached a point where it can be practically applied over a range of relatively ordinary uses. And there are plenty of them.

Today's desktop page scanners offer a surprisingly high level of graphics performance for their prices. Support for 8 bits (256 levels of gray) at a 300-dot-per-inch resolution is now routine, making such scanners useful for a wide range of corporate and professional publishing

GRAPHICS GRAY-SCALE SCANNERS

Graphic artists are
not the only people
who will find uses for
these scanners.

needs. True-gray scans are a fast and affordable way to get halftone images from a service bureau with a high-resolution imagesetter; when paired with the halftoning capabilities of gray-scale editing software, gray-scale scanners make it

feasible to publish continuous-tone images in newsletters, business communications, and other corporate publications produced in-house on ordinary laser printers. (For more information on gray-scale editing software, see "Between Black and White: Six Gray-Scale Editors," *PC Magazine*, October 16, 1990.)

Graphics artists and publishers are not the only people who will find uses for these scanners. Recent improvements in the accuracy of OCR software (see "OCR Software Moves into the Mainstream," October 30, 1990) make an ordinary page scanner with an automatic document feeder capable of doing the sort of high-

quality automated text recognition that once required an expensive specialized OCR system. Combine a page scanner with the low-cost document image-processing software and hardware now coming onto the market and you've got a powerful tool for handling the large amount of paper used in many offices—even electronic ones. Such business uses can only grow in importance as scanners become more and more cost effective.

SCANNING THE GLOBE

In the following pages, PC Magazine Labs evaluates nine general-purpose page scanners (including interface) ranging in price from \$1,490 to \$2,490. The HP ScanJet Plus and its competitors (Abaton's Scan 300/GS, Advanced Vision Research's 3000/GS Plus, Canon USA's IX-30F, The Complete PC's The Complete Flatbed Scanner, DEST Corp.'s PC Scan 3000, Microtek Lab's MSF-300G, UMAX Technologies' UG80, and Xerox Imaging Systems' Datacopy GS Plus), characteristic of the breed, are capable of 8-bit scans, producing 256 levels of gray at a 300-dpi resolution.

All these scanners (and the variety of private-label units manufactured by Ricoh Corp. and TEC, neither of which could be obtained for testing) come in a flatbed configuration, which has proven itself the most versatile arrangement for business uses. Desktop scanners are available in more-specialized formats: The Complete PC and DEST Corp. offer sheet-fed scanners useful for OCR work, for instance, and Chinon America has a line of scanners based on a unique overhead design. But the flatbed configuration allows for more scanning surface to work on, and it also lets you capture images on a variety of media, from single or multiple sheets to mounted illustrations and bound periodicals. With an automatic document feeder attachment, it becomes equally adept at scanning cut sheets.

All of these are full-page scanners. Though the portability and low cost of hand scanners (some of which now support 256 levels of gray) make them appealing to a broad range of users, they are hardly a substitute for their heftier cousins. Hand scanners are useful only for scanning small images, leaving you at a loss when you need to scan full pages and 8- by 10-inch glossy photos. And the skewing and registration problems inherent to hand scanners can significantly degrade text recognition accuracy.

GRAY-SCALE PAGE SCANNERS: SUITABILITY TO TASK

Scanners are versatile, but they are not created equal in their capabilities. Graphics work (whether black-and-white or gray-scale) emphasizes image quality above all; speed is less important. By contrast, with OCR, both speed and image clarity are important to successful recognition by software.

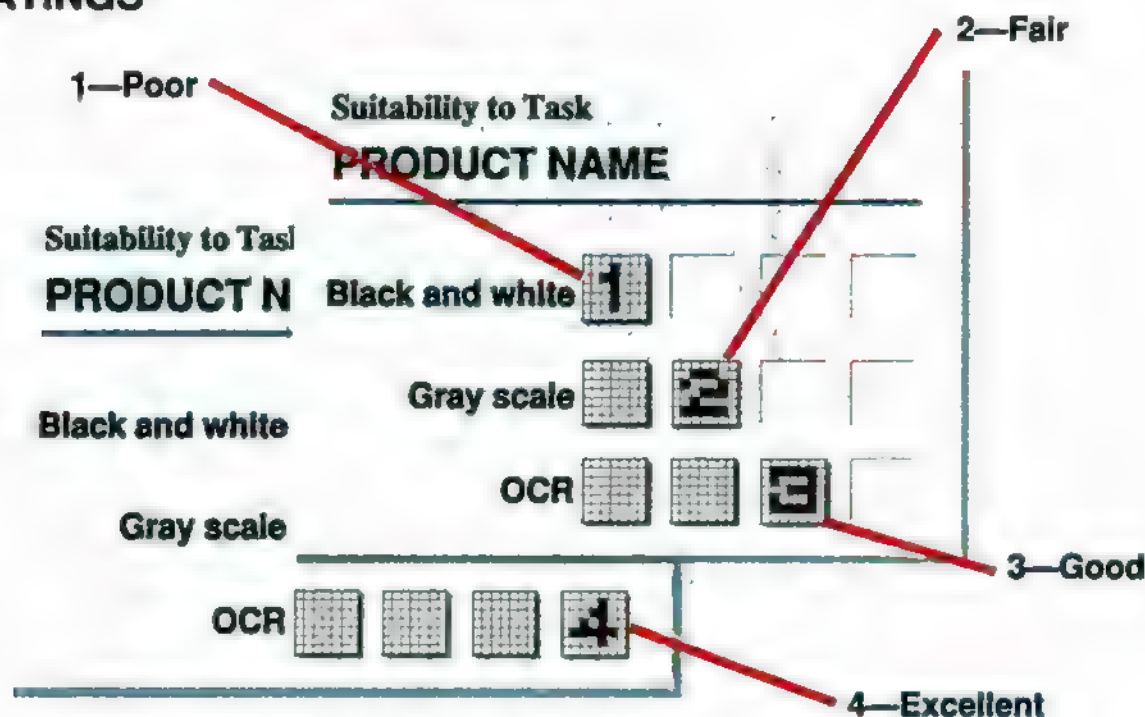
THE TASKS

Black and white evaluates the output quality of the scanner's black-and-white modes. Both the sharpness of the scanner's line-art mode and the variety and resolvability of its dithered scanning modes factor into the score.

Gray scale evaluates the scanner's suitability for scanning photographs and other continuous-tone images in gray scales. The score reflects the dynamic range and clarity of the scanner's gray-scale output and the quality of its bundled image-editing software.

OCR evaluates the scanner's suitability for optical character recognition (OCR) work. In addition to the sharpness and resolvability of the scanner's line-art mode, the score reflects the scanning speed and the operation of its automatic document feeder.

THE RATINGS



GRAY-SCALE SCANNERS

Once the scanner creates the image, a direct-interface card transmits it to the PC.

Gray-scale scanners are fully adequate for the bulk of scanner uses, but the next step is already visible in the low-cost color scanners for the business market that have been introduced over the past year or so. Ranging in price from as little as \$1,295 to \$2,495, these offer full 24-bit color at a 300-dpi resolution as well as gray-scale and black-and-white modes. Abaton's Scan 300/Color, Advanced Vision Research's 3000/CL, Microtek Lab's MSF-300Z, and UMAX Technologies' UC300 are simply color versions of each company's existing gray-scale scanner, while Epson's ES-300C, Howtek's Personal Color Scanner, and Sharp's JX-300 are built as color scanners from the ground up. Given that the cost premium over gray scale alone is fairly small, these units are tempting if you foresee a need for presentation or multimedia color capability. At the time of our testing, software bugs prevented us from making a full evaluation of these scanners (see the sidebar "In Living Color: The Troubles of Color Scanners"), but look for a future review of them.

THE MECHANICAL EYE

The basic technology of a flatbed scanner is relatively simple. Within a sealed box, a fluorescent or incandescent light bulb illuminates the image to be scanned (called the target), and a photosensor called a CCD (charge-coupled device) absorbs the target's reflected light. The CCD is essentially an array of thousands of light-detecting cells, each of which produces a voltage level in proportion to the amount of light it picks up. An analog-to-digital converter then processes these voltages into digital values, whose precision is based on the number of bits per pixel supported by the scanner. On an 8-bit scanner, the range of brightness levels that the CCD can "see" on the target can be divided into 2^8 (or 256) shades of gray.

Once the scanner creates the image, a

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high-speed direct-interface card transmits the image to the PC. Of the scanners we tested, six use a SCSI interface—a fast, flexible standard that in theory lets you interface multiple devices to the PC through a common interface board. Unfortunately, the lack of consistency in SCSI implementations gives this method no inherent advantage over the bidirectional parallel interfaces used by the other three models we looked at, though it does make the scanner compatible with Macintoshes. The Microtek MSF-300G supports a serial interface in addition to its

interface board, and this can be a useful option if you don't have a slot to spare—but the slot you save is balanced off by the speed you sacrifice. The serial interface is much slower than its directly linked counterpart.

Like any AT-bus add-in board, scanner interfaces bring with them the inevitable baggage of device drivers, I/O address settings, and IRQ lines. Generally, fitting them into your setup is fairly straightforward, but you may have to do a

little tinkering if you have a network card or other add-in cards that share the bus. Also, be aware that if you have a 16-bit VGA card, you may have to give up some of its performance. Owing to the limitations of the AT bus design, your VGA card may be forced to drop back to an 8-bit mode in order to coexist with the scanner interface card. (For a more thorough explanation of this situation, see Lab Notes, September 25, 1990.) The Micro Channel interfaces, which nearly all of the units reviewed here support for use with IBM PS/2s, don't have these problems.

IN LIVING COLOR: The Troubles of Color Scanners

Color scanners are hampered by software problems.

by Lori Grunin

The prices of gray-scale scanners overlap with those of the less expensive color units on the market, so why go gray? This story began its life as a comparison of color as well as gray-scale units in order to answer that very question. Unfortunately, finding the answer was slightly harder than we anticipated, leaving a few of us here at *PC Magazine* a bit grayer than when we started out.

To understand the problems we encountered, you first have to know how

color scanners work. When scanning in line-art or gray-scale mode, three-pass scanners are essentially identical to their gray-scale counterparts, right down to using the same CCDs. To capture the color information, however, they make three passes, successively shining light through red, green, and blue filters. An alternate method used by the Epson ES-300C Image Scanner shines three differently colored lights almost simultaneously in order to make a single trip down the scan bed. In either case, 8 bits of infor-

mation are recorded for each color channel to give you 24-bit color.

Obtaining line-art and gray-scale output for our tests was relatively trouble-free. In fact, the Epson surpassed all its rivals, both color and gray-scale, at scanning line art, though none of the color units could beat the HP ScanJet Plus for quality of gray-scale scans. Of the color scanners we tested, only the Howtek Personal Color Scanner seemed to have serious problems with line-art and gray-scale scanning; its excessively dark output indicates that its default brightness setting is probably way off the mark. The rest performed about average on our gray-scale scans, showing slight compres-



The image on the left is the worst of a bad lot scanned in with *Picture Publisher Plus*. It displays anomalous color reduction compared with the image above, which we scanned using *PhotoStyler*. This color reduction is most obvious on the hand and the front of the cello.

BLACK AND WHITE AND GRAY ALL OVER

Most of the scanners reviewed here offer a full range of both black-and-white and gray-scale scanning modes. All support 8-bit scans with 256 shades of gray; five of them let you scan at 4 bits (16 levels) of gray to cut down on file sizes, and one (the Xerox Datacopy GS Plus) offers an intermediate 6-bit (64-level) mode, though this is not supported by the unit's bundled software. All but The Complete Flatbed Scanner also support a range of black-and-white dithered or halftone modes, in

GRAPHICS GRAY-SCALE SCANNERS

which patterns of varying density are used to simulate shades of gray. Finally, all of them have a bilevel black-and-white mode (called a line-art mode) suitable for capturing images to be traced and for scanning text for OCR.

For production-ready art, you will want to scan at the highest resolution and number of gray shades practical. This ensures that you capture the greatest amount of detail for the best-possible output on high-resolution imagesetters.

sions in tonal range, depending upon which segment of the gray-scale spectrum the unit was optimized for. As with the grey-scale scanners, most of the output was usable; all produced editable output.

SLIPS 'TWEEN SCAN AND TIFF

When it came to the color output, however, we ran into some problems. Four of the six scanners came bundled with *Picture Publisher Plus*, two with *Windows Colorlab*, and one with *PhotoStyler*. (The Epson unit comes with both *Picture Publisher Plus* and *Windows Colorlab* plus two other image-handling packages.) We converted the scanned TIFF files to four-color separations and then output them to film.

From the very beginning we noticed problems with all the files from the Sharp JX-300, which uses *Windows Colorlab*. When we imported the files into *Picture Publisher Plus* in order to print them, we were surprised when the software indicated that the dimensions were two orders of magnitude too large; 3,000 pixels read as 3,000 inches rather than 10 inches, as it should at 300 dots per inch. Nor would the files print.

Examining the TIFF header revealed that the resolution of *Windows Colorlab*'s TIFF files was "1 dot per undefined unit" rather than 300 dots. When we asked the vendor, Computer Presentations Inc., CPI explained that when *Windows Colorlab* scans an image, the program saves the raster data in an intermediate, proprietary file format that has no provision for resolu-

tion information; therefore, when the file gets written to TIFF, there is no resolution information to pass along. As a result, when you open the TIFF file with another package, you can encounter unexpected sizing problems.



Since the only accurate way to resize the images would be to use *PhotoStyler*'s built-in resampling feature—which would unavoidably introduce artifacts not present in the original—we could not accurately compare the Sharp's color output with that of the other scanners we looked at.

Had that been the only snag, we might still have been able to run reviews of the color scanners, albeit with more caveats than originally intended. But *Picture Publisher Plus* problems surfaced when we received the color output from the printer; all of the images scanned with that package exhibited unexpected posterizing to varying degrees. One of the scanner vendors

In practice, though, most corporate publications are destined for black-and-white laser-printed output, and even sophisticated publishing environments often use their scanners for capturing low-resolution images for identification and positioning. So don't overlook the utility of the scanner's dithered modes; dithered images scan more quickly and are more compact than gray-scale images, and they are suitable for direct laser output without modification.

On the other hand, you may prefer to scan in gray scales even if your images are

informed us that *Picture Publisher Plus* outputs full-color TIFF files with the color information truncated to 15 bits. When we asked Astral Development Corp. (its vendor) about these problems, we learned that when the scanned data passes through their color lookup table, the last 3 bits in each channel unintentionally get zeroed out; in effect, the binary representation of each color gets rounded to the nearest 2^3 , resulting in slightly different colors.

Astral claims that these rounding errors should have no effect on the output. However, all four *Picture Publisher Plus*-based scans exhibited the same problems, while the *Windows Colorlab* and *PhotoStyler* scans did not. (To verify this, we resampled the Sharp's images and reprinted them out to hard copy.)

At this point we realized that we could not make judgments about the scanners themselves, because we could not reliably isolate how the truncation would affect scanners optimized for different parts of the spectrum. So we were forced to drop the reviews. By the time you read this, both CPI and Astral should have shipped new releases of their software with fixes for their respective problems, a plethora of brand new products will have hit the store shelves, and we will once again attempt to test these scanners. In the meantime, we hope we have given you a taste of some of the types of difficulties you might face when dealing with products in the still-nascent realm of PC-based color-image editing and scanning software. ■

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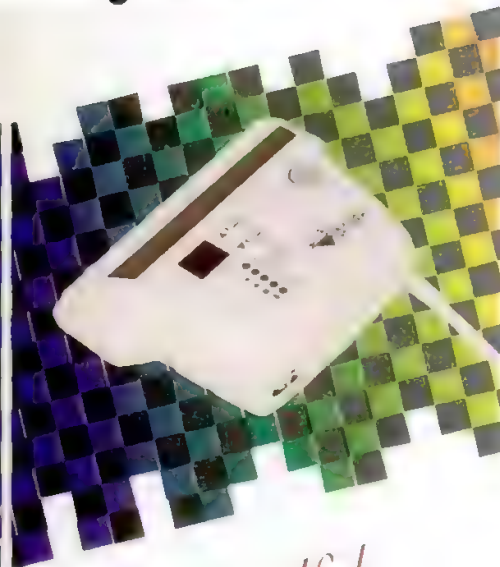
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GRAPHICS GRAY-SCALE SCANNERS

destined for a laser printer. Most of these scanners come bundled with custom versions of commercial gray-scale editing software, such as *Picture Publisher*, *Image-In*, or *Gray F/X*, that lets you scan, adjust and retouch, and save images to a manageable bitmapped format. (For more information on gray-scale editing software, see "Between Black and White: Six Gray-Scale Editors," October 16, 1990.) Provided you have the gray-scale information in the first place, you can adjust the image's brightness and contrast, sharpen or blur its edges with various filters, or apply nonlinear corrections to the gray map for improved definition. Gray-scale editors also offer a range of halftoning options, and starting with a gray-scale image lets you experiment with these options to see which one best suits the image. By contrast, if you scan in dithered mode, you cannot change the image you get from the scanner, and the only way of improving the image is to rescan it.

MEMORY HOGS

You start off with your image. Whether your goal is to fax it or print it, the end result of your scan is an image file, and no matter what the software, you will have a range of file formats to choose from. By far the most popular software for scanners is TIFF (Tagged Image File Format). TIFF files can store both 1-bit (black-and-white) and 8-bit (gray-scale) images, and its latest version (5.0) supports full 24-bit color. Unfortunately, though the TIFF specification is nonproprietary and independently documented, it is open-ended to a fault, which means that complete compatibility with all software is difficult to ensure. For this reason, ZSoft Corp.'s .PCX format is a popular second choice: It supports up to 256 gray scales or colors, and it can be read by *Microsoft Windows* and a host of other products. Other useful formats worth looking at are CompuServe's Graphics Interchange Format (.GIF), which is very stable across platforms and which internally compresses image files, and Encapsulated PostScript



EDITORS' CHOICE

■ HP ScanJet Plus

The gray-scale page scanner market is very active these days; prices are dropping in response to a new breed of color scanners at attractive prices. Amid this welter of products and pricing adjustments, however, our tests show you're best off sticking to the tried and true.

The HP ScanJet Plus, already a best seller and de-facto industry standard, deserves our Editors' Choice from every possible angle. It achieves the highest level of quality both in black-and-white and gray-scale scans. It outstrips its competitors (including the Canon IX-30F, which uses the same scanning engine) in our speed tests. Its *HP Scanning Gallery* and *HP Paintbrush* software is full-featured and easy to use. Best of all, it is backed by a company with one of the best reputations for quality in the business, and with its list price reduced from \$2,190 to a very competitive \$1,590, you won't have to pay a large premium to get the best.

For the most part, the other scanners in our review perform acceptably well on most scores. Of these, the UMAX UG80 and the AVR 3000/GS Plus (the latter reduced to \$1,490 at press time) are a cut above the rest in the overall quality of their output. The Microtek MSF-300G, though slow and poor at text scanning, deserves a nod for its high-quality graphics scans and for the power of its superb *PhotoStyler* software. And the DEST PC Scan 3000 produced exceptionally sharp line-art scans. But none of these are notably better than the ScanJet Plus, and none come close to offering the same all-around value.

Once the bugs get worked out of their supporting software, some of the new low-cost color scanners may tempt you with full 24-bit color scanning capabilities for but a little extra money. Such promises, however, lie only in the future. In the meantime, you can't do better than to follow the leader.

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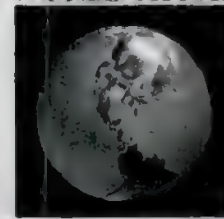
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GRAPHICS GRAY-SCALE SCANNERS

For graphics, the quality of the scans should be your first consideration.

(EPS), the publishing-industry standard, which can accept gray-scale or full-color bitmaps as well as vector information.

Scanned images are hungry for disk space and memory. How much space an image will consume depends on its size, resolution, and the number of gray shades it contains. A 4- by 5-inch image scanned in 1-bit black-and-white TIFF at 300 dpi takes up about 200K. When scanned at 256 levels of gray, however, the same image takes up 1.8MB in TIFF and even more in EPS format. Because of the processing penalties that come with handling such large files, it is important to capture only the necessary information. By using the hardware scan windows built into your scanner or the low-resolution "preview

scan" options supported by most scanner software, you can crop the image down to exactly the portion of the page you want to scan. If your plans include scaling the image down, your best plan is to do so in the scanning process so that the image will be reduced in size before it ever reaches the output file.

Conventional wisdom states that you can get good quality by scanning at a resolution of twice the line-screen of your output device. Scanning at 300 dpi makes sense if the ultimate destination is a high-resolution imagesetter, which can produce publication-quality screens of 120 to 150 lines per inch. But if your scanned image is going to be output on a laser printer, which is capable of a line screen of at most 53 lines per inch, anything much beyond 100 dpi is simply wasted. In fact, you will often find you can reduce this ratio to 1.5 to 1 or even 1.2 to 1 without much perceptible quality degradation; the differences will be nearly imperceptible, except on images with hard edges and strong diagonal lines.

Even with these precautions, you will still find yourself handling some unwieldy

files. That is where file compression steps in. The specification for gray-scale TIFF supports Lempel-Zev-Welch (LZW) compression, though these compressed TIFF files are not readable by all applications. Commercial file-compression utilities, such as *ARC* or *PKZIP*, use similar algorithms. LZW compression works by identifying and tokenizing repetitive pat-

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GRAPHICS

GRAY-SCALE SCANNERS



GRAY-SCALE PAGE SCANNERS: SUMMARY OF FEATURES

Products listed in ascending price order

	AVR 3000/GS Plus	HP ScanJet Plus	Microtek MSF-300G	The Complete Flatbed Scanner	UMAX UG80	Abaton Scan 300/GS
List price (with PC interface and software)	\$1,490	\$1,590	\$1,595	\$1,599	\$1,695	\$1,940
SCANNING CHARACTERISTICS						
Scan resolutions (dots per inch)	75, 100, 150, 200, 300	75, 150, 300	3-300	75, 100, 150, 200, 300	3-300	72-300
Line-art mode	■	■	■	■	■	■
Dither (halftone) mode	■	■	■	□	■	■
Number of dither patterns	16	6	12	N/A	15	256
Number of simulated gray shades	128	60	64	N/A	145	16
Gray-scale modes:						
16 shades	■	■	□	■	□	■
64 shades	□	□	□	□	□	□
256 shades	■	■	■	■	■	■
Color model available	■	□	■	□	■	■
Control-language features:						
Control levels for brightness, contrast	128, 128	255, 255	14, 14	256, 256	50, none	256, 256
Gamma correction	□	■	■	■	■	■
Scaling levels (percentage)	N/A	4-200	1-999	13-200	1-100	25-400
Multiple scan windows	□	□	■	□	■	□
HP emulation (ScanJet/ScanJet Plus)	■/■	■/■	□/□	□/■	□/□	□/□
HARDWARE CHARACTERISTICS						
Bed size	Legal	Legal	Legal	Legal	Legal	Legal
Dimensions (HWD, in inches)	4.6 x 12.9 x 21.3	4 x 13.5 x 18.7	5.9 x 15.9 x 24	4.8 x 13 x 21	5 x 13.4 x 21	4.5 x 13.3 x 21.5
Weight (pounds)	15	15.8	24.2	15	18	22
Front-panel indicators:						
Power on	■	■	■	■	■	■
Error condition	■	□	□	□	■	□
Scan buffer size (default, maximum)	512K, 512K	32K, 32K	64K, 64K	1.5MB, 1.5MB	32K, 32K	32K, 32K
Automatic document feeder	Optional (\$795)	Optional (\$595)	□	Optional (\$499)	Optional (\$525)	Optional (\$595)
Bin capacity (sheets)	100	20	N/A	100	25	50
Fixed settings for letter, legal, and European A4 sheets	■	■	N/A	■	■	■
Continuously adjustable sheet-size settings	■	□	N/A	■	■	■
Minimum sheet size (inches)	5 x 5	7.7 x 10.1	N/A	5 x 5	4 x 4.7	4 x 4
INTERFACE CHARACTERISTICS						
ISA interface/MCA interface	■/■	■/■	■/■	■/□	■/■	■/■
Interface type	SCSI	Bidirectional parallel	Bidirectional parallel	Bidirectional parallel	SCSI	SCSI
Bus width	16-bit	8-bit	8-bit	8-bit	8-bit	8-bit
IRQs supported	9-12	5-7	N/A	N/A	3-5, 9	2-5
Serial interface	□	□	N/A	□	□	□
Optional Macintosh interface available	■	■	■	□	■	■
SOFTWARE						
Scanning and editing software supplied	<i>Picture Publisher</i>	<i>HP Scanning Gallery</i>	<i>PhotoStyler</i>	<i>Picture Publisher</i>	<i>Image-In, Picture Publisher</i>	<i>Picture Publisher</i>
Pixel editing	■	■	■	■	■	■
Global image correction	■	■	■	■	■	■
Masking (area correction)	■	□	■	■	■	■
OCR software included	□	□	□	□	□	□
CUSTOMER SUPPORT						
Hardware warranty	1 year	1 year	6 months	1 year	1 year	1 year
Toll-free technical support number	■	□	□	■	■	□



—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

GRAPHICS GRAY-SCALE SCANNERS

terms in the data, and the results vary, depending on the nature of the image. Scans with lots of white space or broad areas of color, such as line-art scans, can be reduced by as much as 10 to 1 by this method, but compression ratios drop to 2 to 1 or less on information-rich photographic images.

CHOOSING A SCANNER

If graphics are your goal, the quality of the scans should be your primary consideration, speed secondary. Because of the limitations of CCD technology, most page scanners don't really capture a full 8 bits of usable information; electronic noise reduces the actual resolvability of the image to 7 or even 6 bits. The best way to tell how well your scanner does on this score is to look at the output (see the sidebar "Grey-Scale Page Scanners: Gray-Scale Output Quality"). The best-quality hardware translates into output with a wide dynamic range—that is, with good differentiation between subtle shades of gray. The balance between highlights, midtones, and lowlights also bears scrutiny; though many scanning problems can be fixed in software after the fact, the more information you capture up front, the better the end result.

If OCR is your main use for the scanner, you will want to use slightly different criteria for your selection. Fortunately, the most important factor, the OCR software, is no longer dependent on the good judgment of your scanner vendor. Though most vendors do resell a particular brand of OCR software if you should want it, all of these scanners are supported by at least one of the two best lines of OCR software on the market: Caere Corp.'s *OmniPage* 386 and Calera Recognition Systems' *WordScan Plus* (see "OCR Software Moves into the Mainstream," October 30, 1990). Just make sure the scanner you choose is supported by the package you intend to use it with, or at least that it can emulate a Hewlett-Packard ScanJet, which is universally supported.

When choosing a scanner for OCR work, you should look first at the quality of the scanner's line-art modes: The more precise the scan, the more easily the OCR software can read the subtle differences between the letters. At 300 dpi, today's OCR software can read text reliably down to about 10 points in size. But though sophisticated OCR packages such as Caere

Corp.'s *OmniPage Professional* support 400-dpi resolution for reading smaller text, only the Panasonic FX-RS307U supports this resolution in this price range. (We had to drop the FX-RS307U from our review because the manufacturer was unable to get us an interface card on time.)

Speed is also an important consideration for OCR: Though recognition usually takes more time than scanning, the best OCR packages support deferred processing, in which pages are scanned and held on-disk before being recognized. Obviously, the faster the scanner, the more pages you can push through it in a given time period. And if you plan to do more than occasional OCR work, an automatic document feeder—offered as an extra-cost option with all these units except the Microtek MSF-300G—is a necessity. Most hold from 20 to 50 pages.

As with any piece of hardware, the durability of the unit and the quality of the manufacturer's support should be as much in your mind as its performance. You should carefully consider such simple factors as how easy it is to change the light bulb or whether the cover is heavy enough to hold a target in place on the scan bed. The automatic document feeder should be able to handle pages of various thicknesses without jamming or crookedness. And though scanners are remarkably trouble-free for sensitive mechanical devices, look for a solid warranty and good technical support policies to back up your purchase.

Scanner technology has come a long way in the last five or six years, and today's scanners give you a rich degree of capabilities at a surprisingly affordable price. One of these may just be the next important addition to your desktop.

ABATON

Abaton Scan 300/GS

by Tom Unger

Sometimes it is hard to see the forest for the trees. Such is the case with Abaton's \$1,940 Scan 300/GS: There just isn't much to distinguish this scanner from the rest of the pack. The gray-scale scanner-and-interface-kit combination includes the adapter, cable, setup software, and *Picture Publisher* imaging software. The scanner alone costs \$1,595 and the interface kit \$345.

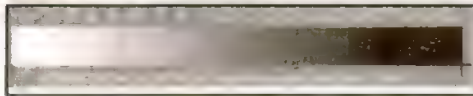
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Canon IX-30F	DEST PC Scan 3000	Xerox Datacopy GS Plus
\$2,140	\$2,195	\$2,490
75, 150, 200, 300	36-300	75-300
■	■	■
■	■	■
8	5	4
32	256	256
□	□	■
□	□	■
■	■	■
□	□	□
254, none	15, 5	225, 225
□	□	■
50-200	13-200	None
□	□	□
□/□	□/□	□/□
Letter 3.9 x 13.5 x 18.8 15.9	Letter 4.3 x 12.5 x 20 17.5	Legal 4.7 x 13.9 x 21.5 22
■	■	■
□	■	□
N/A	1MB, 1MB	28K, 28K
Optional (\$595)	Optional (\$695)	Optional (\$595)
20	30	50
■	■	■
□	■	■
3.5 x 5	5.5 x 5.5	3.2 x 3.2
■/□	■/■	■/■
SCSI	SCSI	SCSI
8-bit	8-bit	8-bit
N/A	2-7	N/A
□	□	□
■	■	■
ScanDo	Image-In	Gray F/X (\$495 extra)
■	■	■
□	■	■
□	■	■
□	■	■
1 year	1 year	90 days
■	□	■



GRAY-SCALE PAGE SCANNERS: Gray-Scale Output Quality

ABATON SCAN 300/GS



The AVR 3000/GS Plus, HP ScanJet Plus, Microtek MSF-300G, and UMAX UG80 show the best gray-scale output, with little loss of detail and only minimal tonal compression. None of these scanners are perfect in their default configurations; each sacrifices either lowlights or highlights. But they still manage to produce quality output.

by Lori Grunin

AVR 3000/GS PLUS



There is a natural tradeoff between the brightness and contrast of an image and the amount of detail in it. A good scan of the color photograph should reproduce (among other things) the highlights on the leftmost woman's forehead, the shadows on the middle woman's sleeve, the stripes on the rightmost woman's tunic, and the dark colors and shadows of the crinkled background behind them.

The scans produced by the UMAX UG80 and the Abaton Scan 300/GS are slightly too bright and have too much contrast, resulting in a total washout of the highlights, but they also show the most sleeve and background detail. And while the majority of the other scanners produced darker output, which sacrifices some sleeve detail, such scans better capture the shadows and highlights. The Microtek MSF-300G's scan is the darkest.

CANON IX-30F



THE 20-STEP GRAY-SCALE STRIP

A scanner's performance on our second test image, the 20-step gray-scale strip (part of the Kodak Q-60C

test target), reflects its tonal range rather than the number of gray shades it can distinguish. Most of the scanners were able to discern about 17 steps; the AVR 3000/GS Plus was the sole scanner capable of distinguishing all 20. (The Complete Flatbed Scanner also recognized 20 steps, but only because it was set far too bright.) The Abaton Scan 300/GS and the Canon IX-30F use green lamps instead of white lamps, which are used by the other scanners. While this design produced no egregious problems in the three-women photograph, these units slightly washed out the cyan and yellow neutral-dye scales on the Q-60C test target.

THE BLACK-AND-WHITE DOCK SCENE

A good scan of the black-and-white dock scene should show crisp reflections on the water and the faint tops of the boat masts (which should not look like dotted i's); also, the output should not lose the details of the background trees. The HP ScanJet Plus produced the best reproduction; however, the UMAX UG80, at a higher default brightness, picked up the most detail on the rocks and grass at the picture's bottom (not shown). By comparison, The Complete Flatbed Scanner's much-too-bright setting results in a very washed-out scan.

In addition to the effects of brightness on the level of detail, there are some tradeoffs in terms of sharpness. Scans made by the HP ScanJet Plus and the UMAX UG80 have relatively sharp lines on the bridge leading to the dock; the AVR 3000/GS Plus's bridge is slightly fuzzy in comparison.

CONTINUES

THE COMPLETE FLATBED SCANNER



DEST PC SCAN 3000



HP SCANJET PLUS



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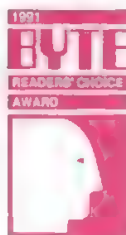
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GRAY-SCALE PAGE SCANNERS: Gray-Scale Output Quality

MICROTEK MSF-300G



UMAX UG80



XEROX DATACOPY GS PLUS



HOW WE SCANNED

Our gray-scale output quality tests evaluate each scanner's performance on both color and gray-scale originals. The two color images we used (the Q-60C color reflection test target and the photograph of the three women) come from *Kodak Color Reproduction Guides*. These were generously provided—along with many words of wisdom—by Dave McDowell, chairman of the ANSI IT8 Technical Subcommittee, Working Group 11, which is working to ratify a standard target for calibrating scanners and output devices. (Information about this project is available from the National Printing Equipment and Supply Association in Reston, Virginia.) To test each scanner's response to gray-scale originals, we used a black-and-white photograph of a dockside scene and also Kodak's SR-37 gray-scale test target (not reproduced here).

We scanned the gray-scale images at a 300-dot-per-inch resolution, with hardware and software in their default configurations. If it was available, we turned on the calibration, but we attempted no other corrections. In practice, you will almost always need to make modifications during and after scanning. But the default results form a baseline for future enhancements and are therefore an important measure of the quality you can expect from the scanner. *Picture Publisher* does not access the scanner's brightness and contrast controls while scanning, requiring that you make these modifications afterward with the software. This is not true of the more-powerful *PhotoStyler*.

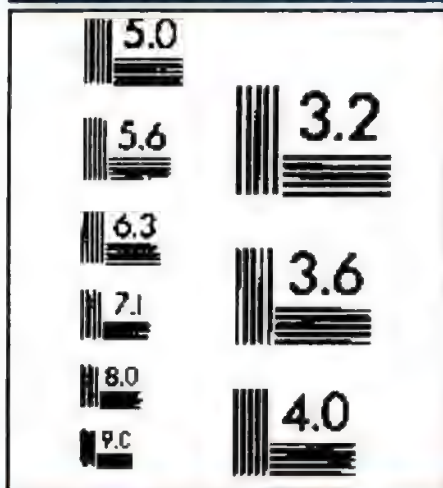
To cut down on the image size and to test each scanner's scaling capabilities, we reduced the images of the three women and the Q-60C target by 50 percent during scanning. The only exception was the Xerox Datacopy GS Plus, whose bundled software does not allow you to scale the image on input. (We scaled down the Datacopy's full-sized output for reproduction here, but we based our quality judgments on the original scans.)

The scanned images were output on film by Digital Pre-Press of Manhattan, using a Varityper 4000/5300 imagesetter (with an Adobe Emerald RIP) at 2,400 dpi (a 133-line screen) for the color originals and 1,200 dpi (a 100-line screen) for the gray-scale originals. TSI Graphics of New Jersey then created Veloxes from the film. A panel that included all the reviewers and the editorial staff assigned to the story judged the output quality. Note that the pages of the magazine are color-balanced separately from the film that we give to the printer, so artifacts may be introduced during the printing process.

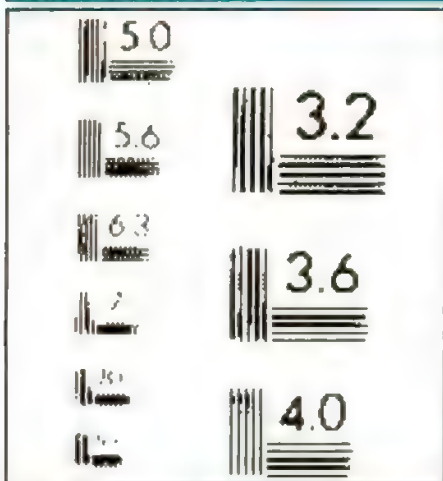


GRAY-SCALE PAGE SCANNERS: Line-Art Output Quality

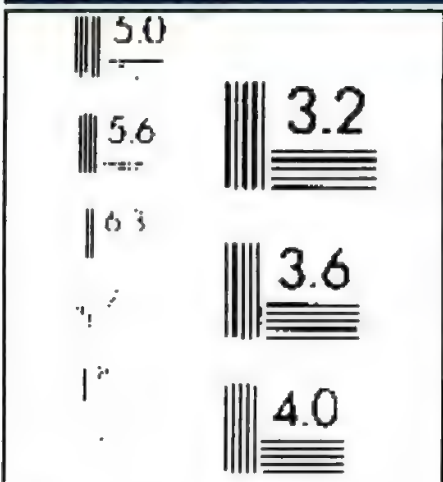
ABATON SCAN 300/GS



AVR 3000/GS PLUS



CANON IX-30F



Most of the scanners had better-than-acceptable resolvability, but the best showing was put in by the DEST PC Scan 3000, followed closely by the HP ScanJet Plus and the UMAX UG80. Resolvability could theoretically be improved in some cases by adjusting the brightness, especially in the case of the Canon IX-30F. In its auto-brightness mode, this unit produced unusable output, but setting the brightness levels manually produced a substantial improvement.

by Lori Grunin

The line-art mode of a scanner has two purposes. In addition to scanning line art, you can use this bilevel black-and-white mode to scan text for optical character recognition. In either case, you want the sharpest, most detailed scan possible; you don't want the scanned image to contain broken hairlines in your logo, nor do you want to see filled-in e's.

On the Microcopy Resolution test chart, 4 cycles per millimeter is a good score for a 300-dpi scanner. By this score, most of the scanners had better-than-acceptable resolvability, but the best showing was put in by the DEST PC Scan 3000, followed closely by the HP ScanJet Plus and the UMAX UG80. Horizontal resolution is more difficult to maintain than vertical because the scan head moves vertically, and it can end up capturing only pieces of lines as the line weight shrinks. Note that some of the Microcopy targets scanned

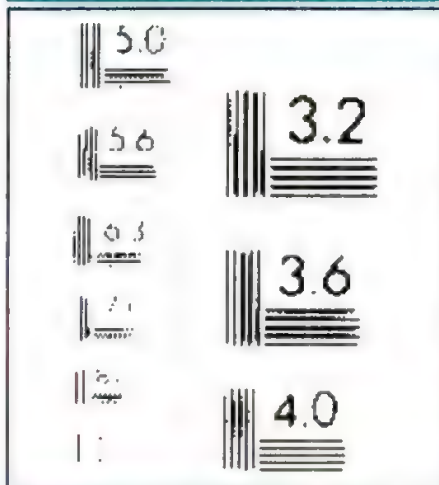
were slightly crooked; there was no time for us to correct this before publication. We did take the resulting artifacts into account when we analyzed the results.

The Gammatrol output from these scanners was generally usable, but slight flaws are apparent. The most notable was too much density around the inside corner of the eye and the loss of some of the lines under the eye. The best scanner, the HP ScanJet Plus, reproduced the image about as well as a scanner of this class can: It had the least amount of fill-in, with relatively little loss of detail. While most of the other scanners lost less of the sparse under-the-eye detail than the HP, their ability to differentiate the fine lines in the corner of the eye was significantly poorer.

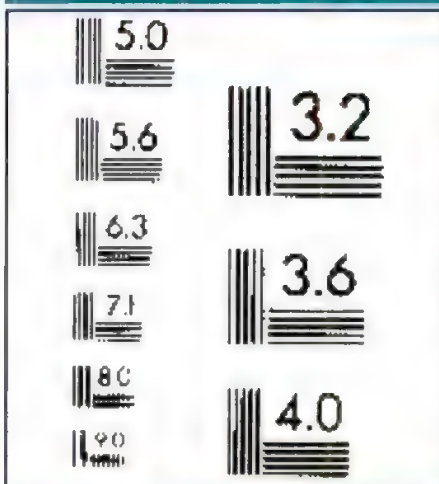
The brightness level is probably the most important factor when scanning line art. Since the brightness setting affects whether a pixel is above or below the threshold, it determines whether a scanner can pick up a particular detail at all. We performed these scans at the default settings, so their resolvability could theoretically be improved in some cases by adjusting the brightness. This is especially true in the case of the Canon IX-30F: In its auto-brightness mode, this unit produced unusable output, but setting the brightness level manually produced a substantial improvement.

CONTINUES

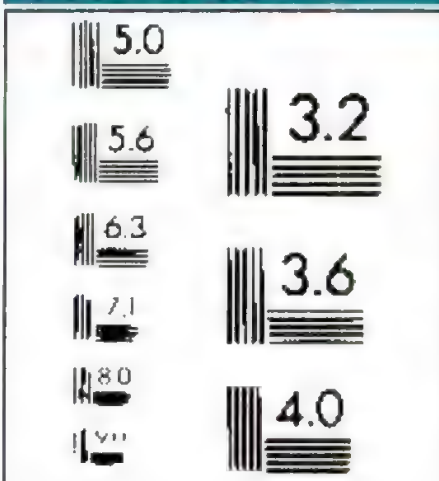
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GRAY-SCALE PAGE SCANNERS: Line-Art Output Quality

HOW WE SCANNED

To measure the clarity of each scanner's line-art output, we scanned several different images at 300 dpi; we reproduce portions of two here. The **Microcopy Resolution test chart** (also called the ANSI and ISO test chart), which was provided by Applied Image Inc. of Rochester, New York, measures scanner resolution. The number on each grid indicates the number of cycles per millimeter in that grid (with a cycle representing a bar plus its trailing space). The more cycles a scanner can distinguish clearly, the better its resolution.

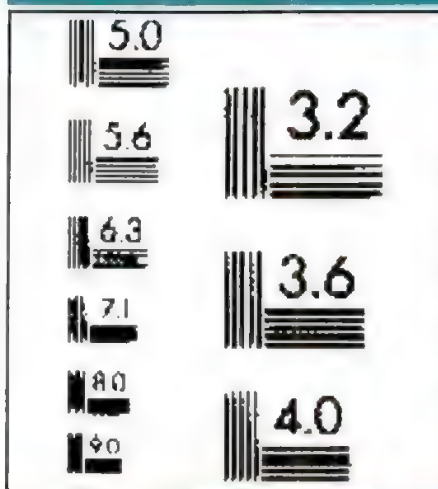
The second target is the **Gammatrol target** provided by the Graphic Arts Manufacturing Co. of Houston, Texas. The complex, detailed line drawing shown here—a portion of an eye—makes apparent a scanner's tendency to fill in or drop out areas on an image. The target also contains structured line patterns of varying weights and a continuous (as opposed to patch) gray-scale strip, which are not shown here. In addition to these images, we scanned in a logo with many curves and lines of various widths and a text page with multiple fonts at various small point sizes.

We scaled the images to approximately 400 percent of their original size. The quality of any bitmap degrades as you enlarge it; however, our goal was not to make pretty pictures but to blow up the pixels enough to see their exact placement. We printed them out on a QMS ColorScript 100. This thermal-wax-transfer color printer is not what most people would recommend for volume printing of monochrome images, but it has less dot gain than a laser printer, allowing us to see pixel relationships more clearly.

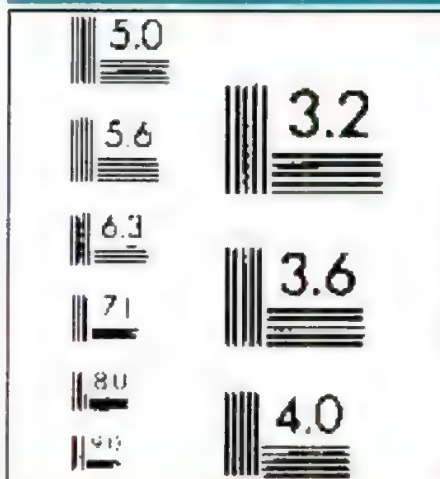
To print the output shown on these pages, we pulled the test images into *PageMaker*, cropped them, and scaled them while preserving the aspect ratio. Here they are printed at the same 1,270 dpi as the magazine, but our judgments are based on the 300-dpi ColorScript output.

ENDS

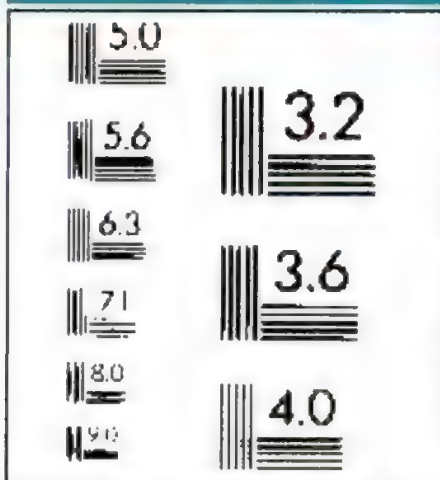
MICROTEK MSF-300G

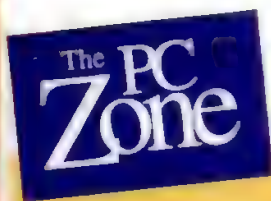


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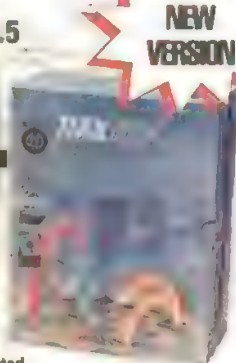
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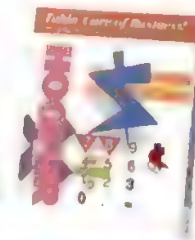
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PERFORMANCE TESTS: GRAY-SCALE PAGE SCANNERS

The HP ScanJet Plus was the fastest performer on two of our three tests, and on the third it closely followed the Canon IX-30F, which uses the same scanning engine.

WHAT THE NUMBERS MEAN

These test results measure the time it takes for a scanner to scan an image, excluding the time the software requires to process the image and load it into memory. Unfortunately, many variables affect the rate at which a scanner can perform this task, making it difficult to isolate those factors responsible for a unit's speed or slowness.

The most obvious example of this inseparability is the Microtek MSF-300G, the slowest scanner tested, and its software, *PhotoStyler*. Unlike the software used by other scanners, *PhotoStyler* displays the image as it is scanned, turning an already slow driver-and-mechanism combination into a glacial package.

Extensive conversation with Microtek failed to reveal any reason the scanner should be so slow—behavior the company feels is anomalous.

The scanning software used makes a great impact. The three scanners with the fastest average times—the HP ScanJet Plus, the Canon IX-30F, and the Xerox Datacopy GS Plus—all use proprietary software.

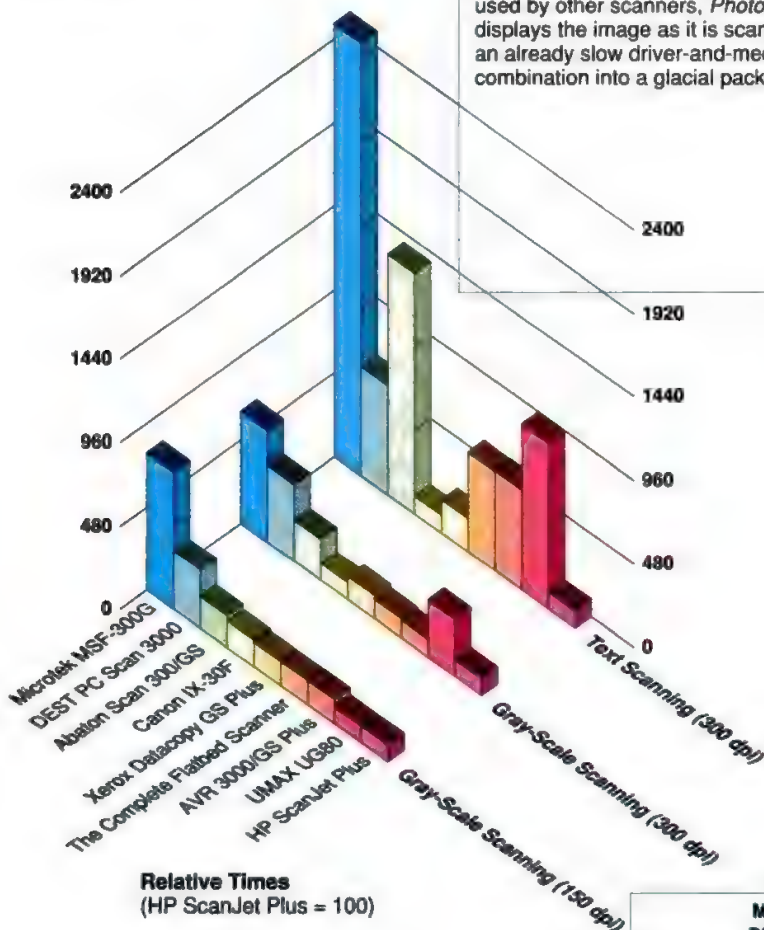
The Canon and HP scanners performed almost identically, primarily because they use the same engine; the slight differences in times can probably be attributed to different drivers and scan-buffer sizes. Similarly, The Complete Flatbed Scanner (which is licensed from AVR) and the AVR 3000/GS Plus performed almost identically as well.

Remember, however, that unless you are doing high-volume work—OCR in particular—speed is a secondary consideration. Most of these scanners fall within an acceptable range for the majority of uses.

HOW WE TESTED

PC Labs performed these tests on Compaq 386/25e's with 300MB hard disks, using the default interface settings where possible, and driving each scanner using the default software bundled with the unit. If the software provided multiple scanning speeds, we used the default, and calibration was turned off.

We ran *Microsoft Windows 3.0* in Enhanced mode with 2MB RAM allocated to SMARTDRV (with a minimum cache size of 1MB) and the remaining 5MB allocated to HIMEM.SYS, for a total of 8MB in the system. The only exception was the Abaton Scan 300/GS, whose version of *Picture Publisher* had problems scanning the larger images in Enhanced mode; we ran the Abaton's tests in Standard mode.



■ The Gray-Scale Scanning tests measure the amount of time it takes to scan a 4-inch-wide, 6-inch-tall black-and-white photograph at 150- and 300-dot-per-inch resolutions.

■ The Text Scanning Speed test measures the amount of time it takes to scan an 8.5- by 11-inch page of text at 300-dpi resolution. Because OCR packages come with their own scanner drivers, these results do not necessarily mirror those you might get with an OCR package; they do reflect the time it takes to scan a full page of line art.

Sometimes the best way to solve a problem is to put two heads together. That's why OCR Systems, Inc. and ZyLAB Corporation—developers of the leading OCR and text search/retrieval products—have teamed up to offer you a special software bundle of their new Windows 3.0 products. ReadRight for Windows and ZyINDEX for Windows will make document management easy for you. Not to mention affordable.

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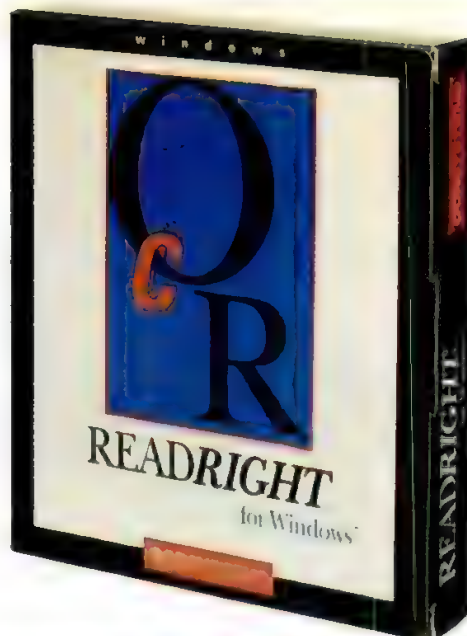
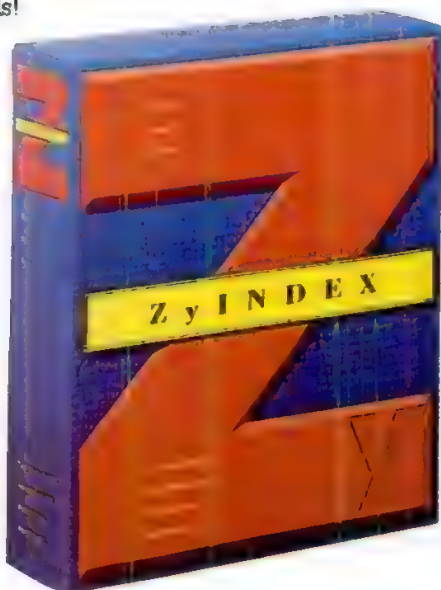
Like a built-in dictionary that enhances ReadRight's already impressive accuracy. You can even add your own words to a user dictionary. And with the pop-up error checker, you can proof the recognized text against the scanned image without ever looking back at the original document.

ReadRight automatically separates text from graphics, even on pages with complex formats, for faster text recognition. Or if you don't want to put the whole page online, you can clip the paragraphs that you want ReadRight to recognize. You can design templates to quickly process pages with similar layouts. And ReadRight handles stacks of pages, single- or double-sided. You can even defer processing so your computer isn't tied up when you need it.

ReadRight reads practically any page—typewritten, type-set, laser-printed, NLQ dot matrix, and fax images. Even text that's bold, underlined, or italics, from 6 to 72 points. And ReadRight outputs the text directly into the formats of your other software applications.

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Once you've recognized your documents with ReadRight, ZyINDEX for Windows can help you to find those documents when you need them. With ZyINDEX, you can simultaneously search through all of your online documents—200,000 pages or more, even entire networks—with results in less than 3 seconds!



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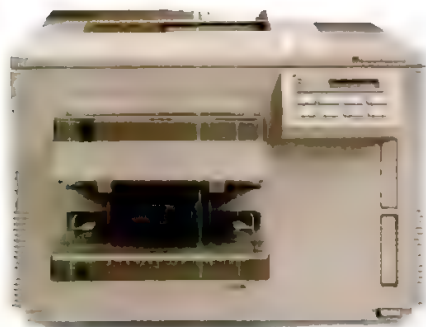
The LaserJet III Si is specifically designed for shared-use environments. Its high-volume paper handling features include two 500-sheet input trays and a monthly duty cycle of 50,000 pages. HP offers software-selectable language switching

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GRAPHICS

GRAY-SCALE SCANNERS

Suitability to Task

Abaton Scan 300/GS

Black and white



Gray scale



OCR



install and operate. The design is as simple as it could be, with only two green LEDs on its front edge: Power-On and Ready. Its resolution ranges from 75 to 300 dots per inch (in 1-dpi increments) and is completely software controlled.

Abaton also offers an optional \$595 50-sheet automatic document feeder, which accepts sheets from 4 by 4 inches all the way up to legal size. We could not test this feeder because the company didn't include it with our review unit.

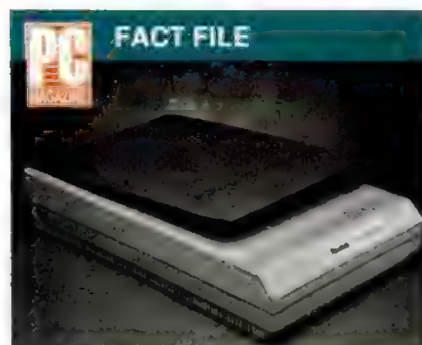
In addition to toll-call support for its scanners, Abaton will ship a repaired scanner overnight back to its owner during the duration of the scanner's one-year parts-and-labor warranty.

DRIVER DIFFICULTIES

After we plugged in the Everex/Abaton SCSI interface board, ran the configuration software that automatically makes certain all preset interrupt jumpers are properly positioned, and installed *Picture Publisher*, we were ready to scan—or so we thought.

Although our first scans of images in the 4- by 5-inch size range were accomplished easily in *Microsoft Windows*' 386 Enhanced mode, as soon as we attempted to scan our 8.5- by 11-inch text page, we discovered that not only did the Scan 300/GS take an inordinate amount of time to complete the scan, it provided only garbled output.

A call to Abaton—a subsidiary of Everex Corp.—yielded the suggestion that Abaton's *Picture Publisher* driver might be incapable of swapping the large chunks of memory needed for full-page scans in *Windows* 386 Enhanced mode when running on our particular test-bed configuration. Switching to *Windows*' Standard mode cured the problem, and we proceeded to complete all our test scans in



Abaton Scan 300/GS

Abaton, 48431 Milmont Dr., Fremont, CA 94538; 800-444-5321, 415-683-2226.

List Price: Scanner only, \$1,595; interface kit with *Picture Publisher*, \$345; automatic document feeder, \$595; *OmniPage/386* (OCR software), \$695.

Requires: 286-based PC or better, 1MB RAM, hard disk, VGA graphics adapter, DOS 3.1 or later, *Microsoft Windows* 3.0, mouse.

In Short: Middle-of-the-road in speed, resolvability, and price, the Abaton Scan 300/GS is an acceptable performer, but others do better without the detractions.

CIRCLE 608 ON READER SERVICE CARD

Standard mode. Abaton assures us that it is investigating the problem and will be updating its driver accordingly. In the meantime, our results show that the Abaton

We'd like to expand advantages of the



GRAPHICS
GRAY-SCALE SCANNERS

The Abaton Scan
300/GS can't keep up
with the HP and
Microtek scanners.

ton Scan 300/GS is slower than about two-thirds of the other scanners in this roundup.

MIXED QUALITY, LONGER WAITS

The Scan 300/GS's easy operability notwithstanding, we found it closer to the middle of the group than the top when it came to image resolvability, brightness, and contrast. On our scan of the ANSI and ISO test chart, the Abaton machine could resolve only up to 4.5 line-pairs per millimeter, while the DEST PC Scan 3000 and HP ScanJet Plus could resolve up to 6.3.

The same middling resolvability was apparent when the Scan 300/GS output our test text page; although individual

letters were well separated, they suffered from poor quality, pixel breakup, and excessive "jaggies," even when the scanner was reading simple 10-point Helvetica type. This might prove daunting to those hoping to employ this scanner for OCR work.

The Scan 300/GS's ability to resolve our Gammatrol test image was hampered to some extent by *Picture Publisher's* inability to adjust brightness. Because the software's brightness algorithm is set to a range of default tolerances rather than customizable to individual scan subjects, we found that the scanner (like other scanners in this roundup) tended to create a darker image with more fill-ins of intricate areas—more than users who require highly detailed scans may be willing to tolerate.

The true strength of the Scan 300/GS was in its 300-dpi gray-scale scan of our color test image of three women. Here the scan produced good contrast and detail, and although its green scan light washed out the yellows and the highlights, it still produced a crisp, clear image. The scan-

ner did equally well on our black-and-white test image.

The Abaton Scan 300/GS can't keep up with the likes of HP's and Microtek's less-expensive scanners, both of which produced superior black-and-white and gray-scale scans with greater resolvability—and at greater speed. Unless you can find a killer discount on this machine, you would do better to look elsewhere.

**ADVANCED VISION
RESEARCH (AVR) INC.
AVR 3000/GS Plus**

by Mitt Jones

Advanced Vision Research bills itself as the only company that both designs and manufactures desktop scanners entirely within the U.S. The company seems equally proud of the aesthetic touches it put into its \$1,490 AVR 3000/GS Plus scanner: Frogdesign, the firm responsible for designing the Macintosh and NeXT computers, fashioned the stylish two-tone gray cabinet, and the scanner mechanism operates at a noise level that would please

on one of the major ultimate DOS.



Suitability to Task

AVR 3000/GS Plus

Black and white



Gray scale



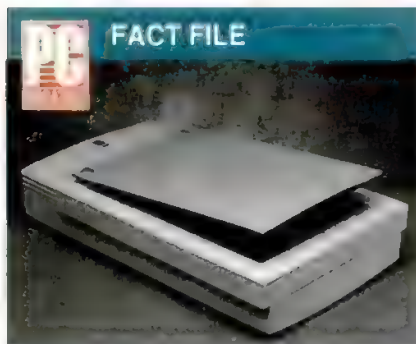
OCR



the most whisper-sensitive librarian. Better still, the company provides these niceties in a package that needs no apologies for its performance and that can be upgraded with a \$995 color-capable engine.

Getting the 300-dot-per-inch 3000/GS Plus up and running shouldn't have been a major challenge, but our evaluation unit suffered from a few rough edges. AVR spreads the installation instructions across three small manuals that tended to contradict each other and mention components no longer in use. The company sent a preliminary version of a new manual that consolidates and updates the installation procedure, but even here the instructions fail to mention the adapter board's jumper

GRAPHICS GRAY-SCALE SCANNERS



AVR 3000/GS Plus

Advanced Vision Research (AVR) Inc., 2201 Qume Dr., San Jose, CA 95131; 800-544-6243, 408-434-1115.

List Price: With interface kit and *Picture Publisher*, \$1,490; automatic document feeder, \$795.

Requires: 286-based PC or better, 1MB RAM, hard disk, VGA graphics adapter, DOS 3.1 or later, *Microsoft Windows* 3.0, mouse.

In Short: This high-performance 300-dpi scanner offers an excellent combination of quality gray-scale scanning and appealing aesthetic design, and since it is upgradeable to color for a reasonable premium, this unit is a good choice for those who might want to go in that direction in the future.

CIRCLE 610 ON READER SERVICE CARD

settings and include only a cursory, inadequate guide to installing and starting the bundled OEM version of *Picture Publisher*. The manual also lacks other useful information, such as a troubleshooting section, a discussion of what software or hardware accessories you might use with the scanner, or any kind of explanation of scanning procedures or tips for optimal performance.

The OEM version of *Picture Publisher* 2.0 that AVR shipped with our evaluation unit lacks some features that some buyers may view as important: the *Picture Publisher* Scanning and Printing Guide, On-Line Tutorial, Quick Reference Card, and 12 Step Grayscale calibration wedge. To get these accessories, something you'll probably want to do, you will have to order them by using the handy card enclosed with the software—for a total charge of \$47.

STRAIGHTFORWARD DESIGN

The 3000/GS Plus seems designed to make scanner operation as straightforward as possible. You will find only one control on the scanner itself—the power button—and one LED indicator, which doubles as



GRAPHICS
GRAY-SCALE SCANNERS

a power and status light. The hinges expand when you lift the cover up and out, allowing you to scan books and other thick materials easily. In addition, AVR offers a capacious 100-sheet document feeder for the 3000/GS Plus, but AVR could not complete production versions of the \$795 option in time for this review.

Like all scanners, AVR relegates most hardware control functions to the software. Unfortunately, the limitations of *Picture Publisher* effectively block you from accessing some of the scanner's hardware features, such as its ability to scan in 4-bit gray-scale mode with 16 shades of gray. Those who need such capabilities can opt for any third-party OCR package that can drive the HP ScanJet Plus, which the AVR 3000/GS Plus emulates.

LOW DROPOUT RATE

The 3000/GS Plus does a good job on graphics scans. It completed PC Magazine Labs' performance tests faster than most of the test machines, thanks in part to its 16-bit Adaptec SCSI-2 controller. The unit was able to scan the 300-dpi gray-scale test image in a brisk 38 seconds.

These tests also showed the 3000/GS Plus at its best—and among the best of the pack—at gray-scale output, both from black-and-white and color targets. The output quality of our test photographs was excellent, showing good tonal range and balance. The scanner produced virtually no highlight or lowlight dropout—a boast that few of its competitors could make.

In line-art mode, the scanner generated acceptable results on the Gammatrol target and on the ANSI and ISO test charts. It fared less well on the text page, which showed evidence of noise. This has more to do with *Picture Publisher*'s AVR driver than the quality of the scanner itself, though. If you intend to use the AVR for OCR applications, be sure that your OCR package directly supports the unit.

The AVR 3000/GS Plus is a fast and extremely well-designed scanner. Its gray-scale output ranks among the best-generated in this roundup, and its quiet operation and good looks come as pleasant bonuses. All of this makes the 3000/GS Plus a good choice for any gray-scale application, and the color upgrade option

makes the scanner an excellent choice for those who like the idea of buying gray-scale now and upgrading to color later.

CANON USA INC. Canon IX-30F

by Henry Fersko-Weiss

Quality images are not automatic with the Canon IX-30F, but if you are willing to play with the manual controls, it will produce admirable scans. Relatively small and light for a flatbed scanner, the unit is also quite fast, though its \$2,140 list price is on the high side compared with the rest.

Suitability to Task

Canon IX-30F

Black and white		
Gray scale		
OCR		



GRAPHICS GRAY-SCALE SCANNERS

ScanDo, the IX-30F's bundled imaging software, runs under *Microsoft Windows 2.x* and offers a good set of scan controls and an automatic setup procedure. You can adjust the image resolution from 75 to 300 dots per inch, can scale the image area from 50 to 200 percent, and can set brightness between -127 and +127 when scanning line art. You can also choose from eight hardware-supported halftones.

The Canon IX-30F has no hardware scan windows, but *ScanDo* lets you do a preview scan in the lowest possible resolution and then frame any portion of it for full-resolution scanning. You can also mirror or reverse the image and draw on it while you scan, choosing the size of the line and its shade of gray. However, *ScanDo* (written by Hammerlab Corp.) has no gamma correction or contrast control, so you'll have to go to a full-fledged gray-scale image editor such as *Picture Publisher* for full functionality.

FAST PERFORMANCE

The Canon IX-30F did extremely well on our performance tests. With the HP ScanJet Plus, it was the fastest at gray-

scale and line-art scans alike. On all the tests except for the gray-scale scan at 300 dpi, the IX-30F came in just behind the HP ScanJet Plus, which uses the same Canon-built scan engine but with a different controller board. Unlike the HP machine, which uses a bidirectional parallel interface, the Canon IX-30F uses a SCSI interface, so it can be used directly with a Macintosh computer. Its automatic document feeder (\$595) worked without a hitch, though it can handle only 20 sheets.

The IX-30F earned mixed results when it came to image quality, however. On both the gray-scale scans of color and black-and-white photographs, it produced sharp images with a good delineation of grays and nice detailing—very true to the originals. However, the images tended to be somewhat on the dark side and slightly fuzzy in spots. For the scanned image of the 260 color target, the IX-30F used the same gray shade to represent different shades of yellow found on the original. This may be attributable to the scanner's green lamp, which washed out all the yellows to a single shade and darkened all



Canon IX-30F

Canon USA Inc., 1 Canon Plaza, Lake Success, NY 11042; 800-892-0020, 516-488-6700.

List Price: With interface kit and *ScanDo*, \$2,140; automatic document feeder, \$595.

Requires: 286-based PC or better, 1MB RAM, hard disk, VGA graphics adapter, DOS 3.1 or later, *Microsoft Windows 3.0*, mouse.

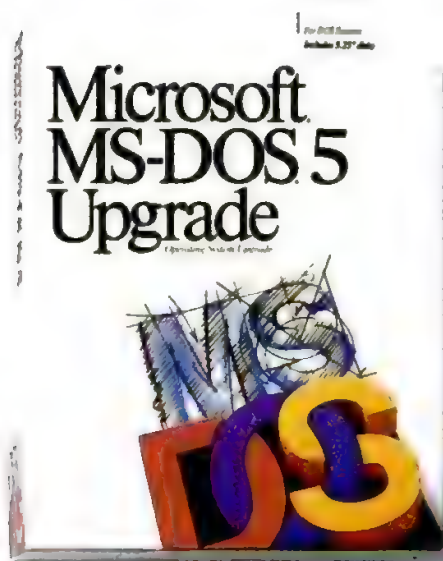
In Short: The Canon IX-30F is compact, light, and quite fast. It can produce high-quality gray-scale images if you are willing to fiddle with the manual controls, but our line-art test scans were severely overexposed.

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variations of magenta to another.

The IX-30F has more-serious problems with line-art and text scanning, revealing problems with its automatic

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Installs quickly and easily across different PC hardware, even from a network.

GRAPHICS GRAY-SCALE SCANNERS

THE COMPLETE PC The Complete Flatbed Scanner

by John R. Quain

threshold adjustment. On our tests, the unit so overexposed the line-art images that all the fine lines and shading details were burned out; in the Gammatrol scan, some shading details vanished, making the image seem oddly vacant in places. In a logo scan test, the hairline curve delineating the top of a J disappeared, and when we gave it a page of text containing different typefaces, the scanned image yielded letters that were too light and often broken in the curves.

When *ScanDo* is used in auto mode, it gives over control to the scanner itself, and this is when the problems occur. Canon says the poor results may have to do with the particular unit we tested. In any case, you can avoid these problems by scanning line-art images in manual mode and adjusting the brightness. However, working in manual mode takes patience; you have to scan the image repeatedly until you find the right setting.

Except for its brightness problem, the Canon IX-30F operated smoothly and efficiently. If you're willing to fiddle around with the manual controls, it is a fast scanner capable of producing some rather good images.

It is futile to try to create a product that's all things to all people, so it should come as no surprise that The Complete Flatbed Scanner does not quite live up to its name. Though this \$1,599 unit is a straightforward and inexpensive 8-bit gray-scale scanner that can please users with modest desktop publishing requirements and recession-weary budgets, it fails to measure up to equally low-cost competition.

The Flatbed handles legal-size originals in line-art mode or gray-scale at either 16 or 256 (4-bit or 8-bit) gray levels; there is no dithered or halftone mode. The company bundles the scanner with *Picture Publisher* to run under *Microsoft Windows 3.0*, and via the software you can select scan resolutions in increments of 75, 100, 150, 200, and 300 dots per inch. The Flatbed can also be used with

The Complete PC's fax board products.

When we tested this model, the company's automatic document feeder was not available. By the time you read this, however, The Complete PC expects to be shipping a \$499 100-sheet feeder for users who scan in volume. The scanner is capable of HP ScanJet Plus emulation, which is supported by a wide array of OCR packages.

UNCOMPLICATED HARDWARE

The hardware itself is uncomplicated. If you are a careful worker who is quick with a screwdriver, you can scan pictures of babies and VPs within the first 40 minutes. Installing the software driver, which

Suitability to Task

The Complete Flatbed Scanner

Black and white 1

Gray scale 1

OCR 1

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work software and TSR's can be loaded high into upper memory.

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MS-DOS System Version	Maximum Free Conventional Memory	Maximum Free Conventional Memory on a Networked PC
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4.01	565K	480K
5.0	621K	613K

The numbers given are specific to a particular 386 system. These numbers may vary on different hardware and software configurations.

Microsoft

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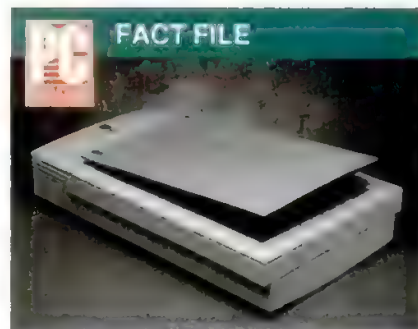
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allows you to set the I/O address and DMA channel (1 or 3), is essentially automatic. On our tests, the defaults worked without requiring us to play with DIP switches. The only difficulty inexperienced users will encounter is *Picture Publisher*. Its primary weakness is poor image display, which makes it tough to judge where to crop your scans.

The Flatbed offers only one speed: fast. On PC Magazine Labs' tests, it was a

GRAPHICS GRAY-SCALE SCANNERS

reasonably quick performer in both the 150- and 300-dpi resolutions. Its output quality looked very good initially, especially for the line-art scans of logos, which retained their smooth curves with a minimum of fuzziness. When we compared the Flatbed's output with that of the other tested scanners, however, its flaws became more apparent. In terms of line-art



The Complete Flatbed Scanner

The Complete PC, 1983 Concourse Dr., San Jose, CA 95131; 408-434-0145.

List Price: With interface kit and *Picture Publisher*, \$1,599; automatic document feeder, \$499.

Requires: 286-based PC or better, 640K RAM, hard disk, VGA graphics adapter, DOS 3.0 or later, *Microsoft Windows* 2.11 or later, mouse.

In Short: Not as complete as the name implies, The Complete Flatbed Scanner lacks a dithered black-and-white mode and turns out mediocre scans. Since some competitors match or beat its low price, this scanner is hard to recommend.

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resolvability, it fell in the middle of the performance range. The Flatbed dropped some details and significantly filled in empty areas on the Gammatrol chart. Scanned text pages looked legible and individual characters were clear enough; however, there was considerable breakup on some letters, such as ragged vertical edges on lowercase d's and l's.

The scanner fared worse on gray-scale reproduction of photographs. Its output was far too bright, compressing the tonal range and washing out lighter areas in the process. This reduces the amount of information in your scan files and therefore limits the amount of postscan touching up you can do via software.

The company ships the unit with a calibration file already installed. However, users should acquire a calibration strip and create their own calibration files to improve the scan results. The Complete PC does not supply the necessary calibration strip, but users can purchase it from *Picture Publisher*'s manufacturer, Astral, for around \$10. You should also make further brightness and contrast adjustments in *Picture Publisher* before you scan.

The Complete Flatbed Scanner is quick and inexpensive, but its scan quality could be better. If your needs are modest and speed is your primary concern, this scanner may be worth a look, but most users will be better off with a higher-quality competitor.

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DEST CORP. DEST PC Scan 3000

by Bruce Brown

All you can really ask for in a scanner is good design and construction, ease of use, and a reasonable price. The DEST PC Scan 3000 is such a machine. The bundled package lists for \$2,195 and includes the scanner, a PC interface kit, *Image-In* im-

Suitability to Task

DEST PC Scan 3000

Black and white



Gray scale

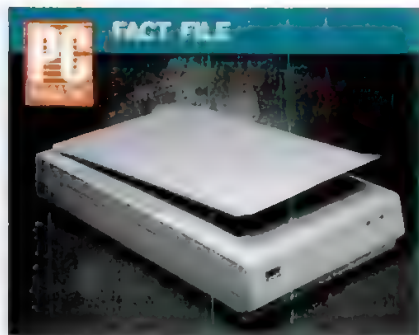


OCR



age-capture software, and DEST's own *Recognize* OCR software. In fact, this is the only scanner in this roundup that includes OCR software in its standard package, and its exceptionally sharp text scans make it stand out for that purpose.

The DEST system is also available unbundled at \$1,395 for the scanner alone, with an additional \$215 for the PC interface kit (an MCA interface kit costs \$295), \$498 for a special version of *Image-In*, and



DEST PC Scan 3000

DEST Corp., 1015 E. Brokaw Rd., San Jose, CA 95131; 408-438-2700.

List Price: With interface kit, *Image-In*, and *Recognize* (OCR software), \$2,195; scanner alone, \$1,395; interface kit alone, \$215; automatic document feeder, \$695; *Image-In*, \$498; *Recognize*, \$695.

Requires: 286-based PC or better, 1MB RAM, hard disk, VGA graphics adapter, DOS 3.1 or later, Microsoft Windows 3.0, mouse.

In Short: The DEST PC Scan 3000 is a good, sturdy performer. Exceptionally fast and clear text scanning, a good automatic document feeder, and the inclusion of *Recognize* in the standard package make it a good choice for OCR work.

GRAPHICS GRAY-SCALE SCANNERS

\$695 for *Recognize*. Options include a 30-sheet automatic document feeder, which is also \$695. Installing it is fairly simple. If the default settings for the DMA, IRQ, and port addresses do not work, you can either use the software configuration or manually change the CONFIG.SYS yourself. The installation process is well-documented; you'll be up and running in no time.

KEEPING IT SIMPLE

Simplicity is the key to the PC Scan 3000. This 300-dot-per-inch flatbed scanner offers minimal controls and indicators; an 8-character LED panel used for error codes is visible from under the glass inside the scanner.

The scanner does both line-art and 256-shade 8-bit gray-scale scanning in resolutions from 38 to 300 dpi. However, there are only 5 dither patterns for halftone scan-

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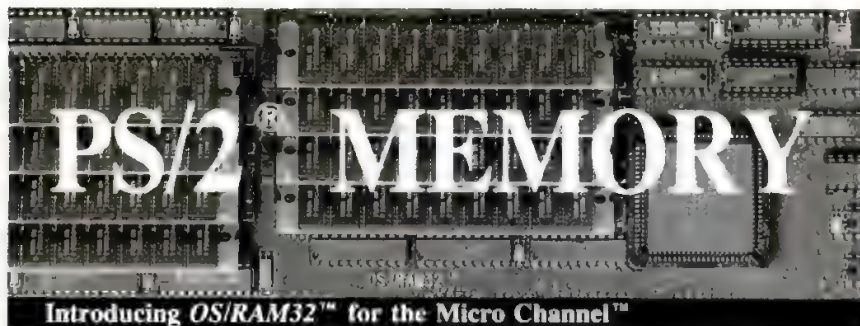
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ning, 5 contrast levels, and 15 brightness settings. It comes with *Image-In*, but the bundled version of the software includes neither the module for managing scanned files (Panorama) nor the OCR module (Reader) found in the commercial version.

The PC Scan 3000's tested scanning times for 150- and 300-dpi gray-scale scanning fall slightly below the average, but its 300-dpi text scanning speed is among the fastest. In terms of quality, the scanner does a reasonable job with gray-scale scanning, but shines on line art. The PC Scan 3000 proved more sensitive to reds than greens or blues on gray-scale scanning of a color sample, causing greens and blues to come out a bit darker at the default settings, but no detail was lost. On our resolution test scale, however, it resolved clearly down to 5.6 line pairs per millimeter—a fine result.

The DEST unit's sharpness and the quality of its text scans (our text scan showed no character fill-in or breakup at all) makes it a good choice for OCR work. Its automatic document feeder is sturdy and easy to use; it worked fine, with no hint of jamming, even when we added paper after starting the scanning process. For other materials, the paper-feed tray tilts so

you can put oversized or undersized single sheets, books, or magazines on the flatbed without having to remove the document feeder.

The DEST PC Scan 3000 works well with no surprises, and is a good choice if you want primarily black-and-white scanning with the option of gray scale.

HEWLETT-PACKARD CO. HP ScanJet Plus

by Alfred Poor

Some products do wonderful things but make your life miserable in the process. Then there are those like the 256-level gray-scale HP ScanJet Plus, which give you all the power with none of the headaches. With a combined list price of \$1,590 for scanner and interface, it is one of the least expensive products in this roundup and its excellent all-around performance makes it by far the best value.

The thoughtful design behind the ScanJet Plus is evident from the moment you start to set it up. The installation program sets up the scanner software for you. It even automatically analyzes your comput-

GRAPHICS GRAY-SCALE SCANNERS

The thoughtful design
behind the ScanJet is
evident from the
moment you start
to set it up.

er's configuration to give you suggested switch settings for the interface board. Many scanners have a shipping screw that you must remove; the ScanJet Plus has an easy-to-see green handle on the bottom of the case. Pull it out to unlock the mirror and you are ready to scan. Pushing it back in locks the mirror for when you want to move the scanner. You will never have to hunt for a missing shipping screw.

A WEALTH OF OPTIONS

The *HP Scanning Gallery* software provided with the scanner runs under *Microsoft Windows 3.0*. The interface is easy to use, and anyone with any scanning experience will probably be able to figure out most of the features without even cracking open the manual. First you run a quick preview scan to display a rough on-screen picture of the image, then you click and drag an outline to indicate the target region you want to scan.

You can select the type of image, resolution, scaling, and exposure levels right on the main screen. The image types include line art, 16- and 256-level gray scales, and six halftones: normal, fine, vertical-line screen, horizontal-line screen, and diffusion. This last halftone is a random dot pattern that mimics the look of photographic silver crystals, so your image looks much like a grainy photograph. The ScanJet allows you to choose from 75-, 150-, or 300-dot per-inch scanning and can scale the image from 4 to 200 percent of the original size. In addition, you can either select automatic exposure control or adjust the brightness, white, and black levels individually; either way, you immediately see the effect of your changes on the preview scan image.

You can send the output directly to a file in a variety of useful formats, including EPS, .PCX, and TIFF, or send it to the

GRAPHICS

GRAY-SCALE SCANNERS

Suitability to Task

HP ScanJet Plus

Black and white



Gray scale



OCR



Windows Clipboard instead. You can also use the Copy Print feature to send the image directly to a printer. If you want to edit the image, the scanning program can automatically load and run *HP Paintbrush*, a sophisticated paint program with special features for gray-scale editing, including filters for blending, equalizing, and sharpening, plus effects such as smudge, brightness, contrast, and gradient fills.

Hewlett-Packard also offers an optional 20-sheet automatic document feeder (\$595) and *HP AccuScan* OCR software (also priced at \$595), both of which work well. The scanner and software had no trouble with a three-page typewritten document, which they converted with no misfeeds and very few mistakes.



HP ScanJet Plus

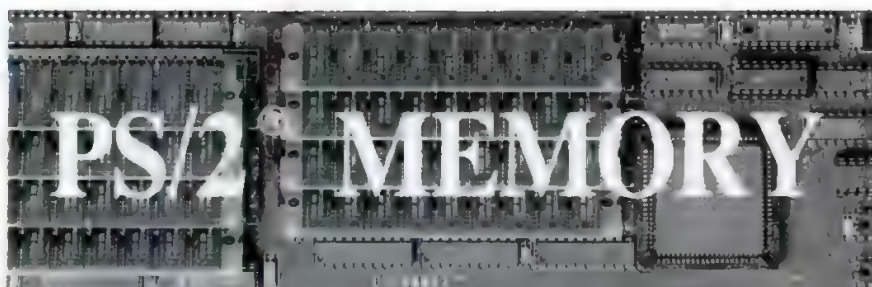
Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900.

List Price: Scanner only, \$995; interface kit with *HP Scanning Gallery*, \$595; automatic document feeder, \$595; *HP AccuScan* (OCR software), \$595.

Requires: 286-based PC or better, 640K RAM, hard disk, EGA or VGA graphics adapter, DOS 3.3 or later, *Microsoft Windows* 2.11 or 3.0, mouse.

In Short: Excellent speed and quality in both gray-scale and line-art scans at a very competitive price make the HP ScanJet Plus the best all-around choice.

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GOOD PERFORMANCE

The ScanJet Plus was either the fastest or close to the fastest on all tests. Its speed was not at the expense of image quality, however. Our panel of reviewers decided that this scanner's output was among the best, with excellent tonal range on both color and gray-scale originals. HP is known for providing solidly built products, and the HP ScanJet Plus is no exception. The company backs the ScanJet Plus with a one-year parts-and-labor warranty, for which you must return the unit to the dealer or an HP repair depot.

Solid construction, ease of use, and good scanning quality—all at an affordable price—make the ScanJet Plus the full-size gray-scale scanner to buy.

MICROTEK LAB INC. Microtek MSF-300G

by Kellyn Betts

If price and quality are what you need from a scanner, consider Microtek's MSF-300G. It may be slow, but like the proverbial tortoise, it gets the job done. The MSF-300G delivers high-quality gray-

scale scans, especially now that it is teamed up with *PhotoStyler*, an impressive new color-image-processing package that may well be the best on the market.

The Microtek MSF-300G may be slow, but like the proverbial tortoise, it gets the job done, delivering high-quality gray-scale scans.

A \$1,595 price tag makes this scanner among the least expensive in its class. This new price, a reduction from the previous \$1,895 ticket, is Microtek's way to stretch the popularity of the four-year-old MSF-300G through its twilight years. By the time you read this, Microtek will have in-

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GRAPHICS GRAY-SCALE SCANNERS

roduced two new 600-dot-per-inch scanners priced at \$1,895 for gray scale and \$2,495 for color. Besides having twice the resolution, the new 600-dpi scanners will be smaller and will have longer warranties than the MSF-300G—one year instead of six months.

For now, the MSF-300G is the Goliath of the 8-bit crowd. This well-built scanner demands 35 percent more desk area on average than its peers. And like many of nature's larger creatures, this monster moves more slowly than its smaller kin: It took more than twice the average time to plod through scans, turning in the longest times by far on all but one of our timed tests. Microtek says that this is anomalously slow but was unable to come up with a reasonable explanation for it, and despite our efforts its times failed to improve much.

EASY INSTALLATION

This scanner is extremely easy to install. Hardware-wise, all you have to do is plug the half-length 8-bit interface card and cables into the appropriate slots and connectors and possibly change the DIP switches. The scanner can also communicate using RS-232C or RS-422 serial interfaces if you don't have a slot available, but this is likely to be even slower.

One of the few bundled packages in this group to fully support VGA under *Microsoft Windows 3.0*, *PhotoStyler* automatically checks for the presence of a Microtek scanner and changes your CONFIG.SYS file so you can immediately begin scanning. Because it monitors the MSF-300G self-diagnosis routine each time you turn

scanning. A halftone mode option lets you choose from 12 different dither patterns; it also supports downloadable dither patterns. The scanner's 14 brightness levels may seem paltry, but the range of adjustment they allow for (between -42 and +49 percent for brightness and -18 to +21 percent for contrast) should prove sufficient for most needs.

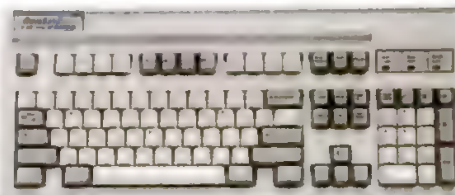
HIGH MARKS FOR DETAILING

The MSF-300G did very well on our line-art and gray-scale tests, capturing more detail than did most of its peers. Its gray-scale scans picked up an impressive amount of contrast when scanning from monochrome originals and slightly less from color originals, but these scans tended to be a bit dark. There are no gray-scale calibration options.

The scanner did not do as well on our

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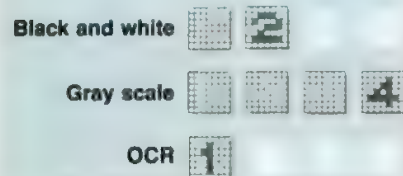
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Suitability to Task

Microtek MSF-300G

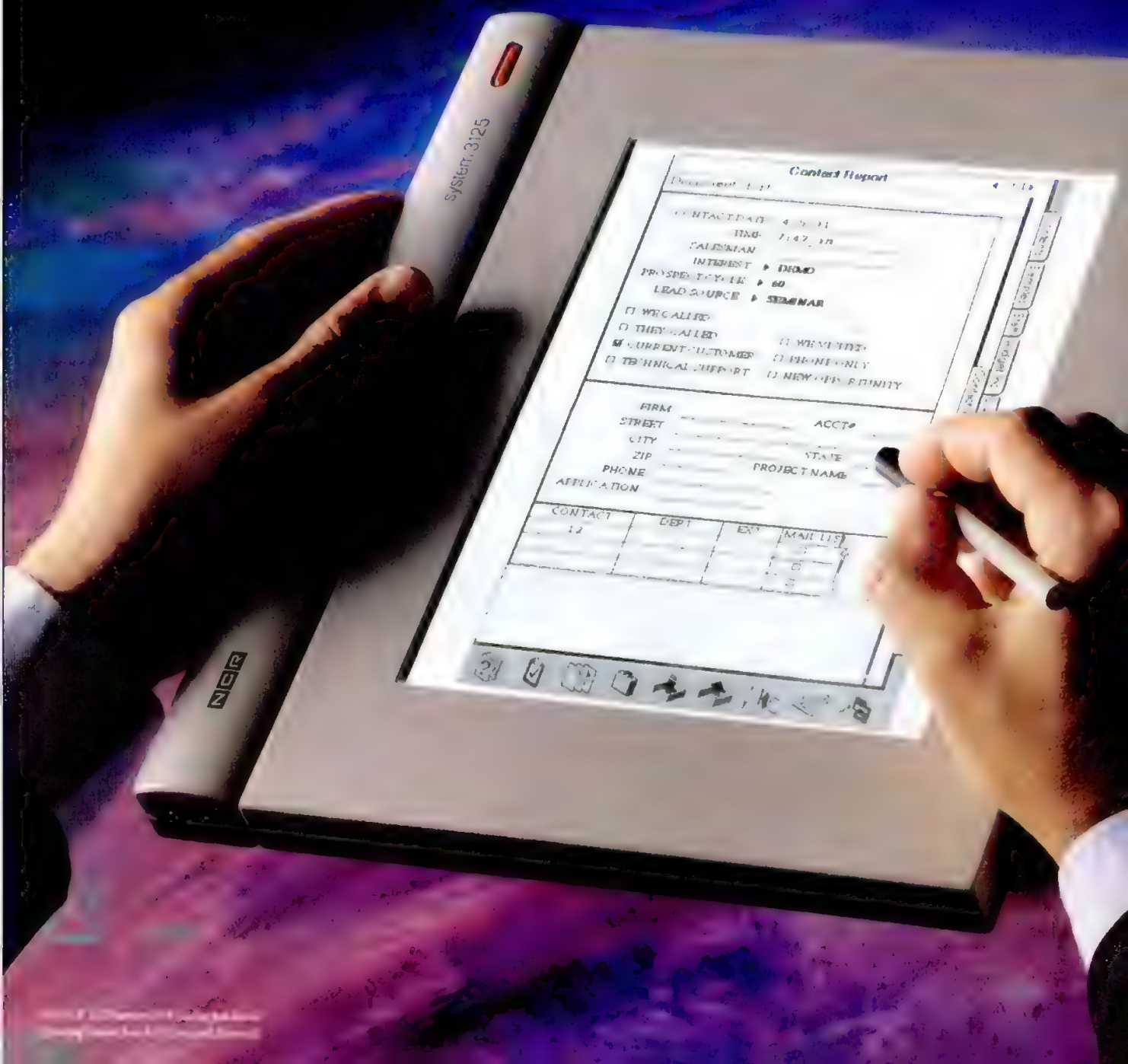


on the scanner, the software immediately knows if the scanner is not working properly. During our tests, it even noticed that we had changed Microtek scanners, and it reconfigured itself appropriately.

PhotoStyler provides a far greater amount of control than most of its peers do. You can specify resolutions from 3 to 300 dpi for line art and 8-bit gray-scale

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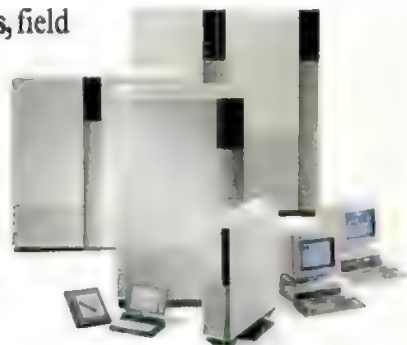


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GRAPHICS GRAY-SCALE SCANNERS

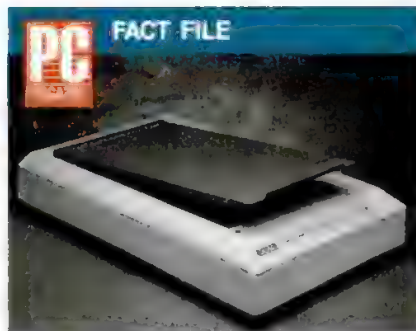
The Microtek scanner is noteworthy for providing the greatest range of scaling options, though their implementation may be a bit confusing.

SCALING THE HEIGHTS

The Microtek scanner is noteworthy for providing the greatest range of scaling options, but you may find their implementation a bit confusing. Ostensibly because of its ability to scale scans up to 999 percent, *PhotoStyler* initially insists on displaying each image at as close to its actual resolution as possible. It does so by displaying one dot for each dot it has scanned in (designating that image as a 1:1 scan). Since most monitors display approximately 75 dots per inch, pictures can quickly get larger than what a 14-inch monitor can display, especially at higher resolutions. For example, an image scanned in at 300 dpi and 100 percent scaling (or at 150 dpi and 200 percent scaling) would be magnified by four times, so even if the original image were 5 by 7 inches, the 1:1 scan version would not fit on a 14-inch screen. The software does offer a number of viewing options, including "fit on screen," so you can easily reduce the image size.

A unique feature of this scanner is its variable scan velocity settings. We found that setting the scan rate to the fastest speed

text test. It didn't produce the regular letters that many of the other scanners did, and text in 10-point Times tended to either break up or join together. Microtek claims that you may get better performance by using one of the OCR packages that come with Microtek drivers, but because the scanner lacks an automatic document feeder option, it is a rather poor choice for OCR work.



Microtek MSF-300G

Microtek Lab Inc., 680 Knox St., Torrance, CA 90502; 213-321-2121.

List Price: With interface kit and *PhotoStyler*, \$1,595.

Requires: 286-based PC or better, 1MB RAM, hard disk, VGA graphics adapter, DOS 3.1 or later, Microsoft Windows 3.0, mouse.

In Short: Quality graphics scans and terrific *PhotoStyler* software compensate for the Microtek MSF-300G's slow performance in graphics work, but poor text output and the lack of an automatic document feeder rule it out as an OCR solution.

CIRCLE 615 ON READER SERVICE CARD

possible made no difference in our timed performance tests, however. Microtek claims that this feature works best with small targets, such as 4-by-5-inch images, that are scanned at a relatively low resolution of 75 dpi or below.

The MSF-300G can offer great scans if you are willing to work with it—and wait for it. High graphics quality and low cost make the MSF-300G a good investment if your work is limited to graphics.

UMAX TECHNOLOGIES INC. UMAX UG80

by Greg Pastrick

Simply put, the UMAX UG80 8-bit gray-scale scanner is a well-built, reliable workhorse. This \$1,695 300-dot-per-inch flat-bed unit offers quality gray-scale scanning at a reasonably competitive price.

The UG80 has 8-bit gray-scale capabilities covering 256 levels of gray as well as bilevel line-art modes. It sports a legal-size scanbed with a sturdy but flexible cover to handle scan targets from a variety of sources. A standard 8-bit SCSI interface accompanied by suitably detailed documentation makes for a mostly plug-and-go installation and setup. The UG80 comes bundled with either a custom version of *Image-In* or a stripped-down version of Astral's *Picture Publisher*. And UMAX sells an optional \$525 top-mount automatic document feeder that handles up

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Suitability to Task

UMAX UG80

Black and white



Gray scale



OCR



to 25 sheets of material without bending, folding, or mutilating them in the process.

The UG80 has a consistently high level of resolvability, and its sampling of text is particularly good. Our scans of Kodak's SR-37 gray-scale strip shows the unit's strong capability for distinguishing a dynamic range of subtle grays; it was able to distinguish 34 or 35 of the strip's 37 levels of gray. However, by default the UG80's output tends to have too much contrast and brightness, so highlights appear washed out. While this deficiency can be attributed to the lack of any contrast controls in the hardware, the UMAX scanner suffers no loss in its ability to capture a high level of detail, as shown in the output produced from the color and halftone photograph test scans in 8-bit gray-scale mode at 150- and 300-dpi resolutions.

ABOVE-AVERAGE IMAGES

The UG80 owes its better-than-average image capture ability to its workmanlike scanning modes and capabilities. Its dith-

ered black-and-white mode offers 15 dither patterns and 145 simulated levels of gray, and it's capable of resolutions from 3 to 300 dpi in 1-dot-per-inch increments. Multiple scan windows and scaling from 1 to 200 percent expand your scanning options.

For better or worse, access to the hardware capabilities is supported and managed by *Picture Publisher*, the imaging software that came bundled with the unit for testing. UMAX offers a custom version of *Image-In* that has extra interface features as a software option, too. While the unit has no built-in gamma correction curves and allows for adjustment of highlights and shadows, the Astral software comes with some canned curves for UMAX scanners and allows you to easily build and apply curves for the specific model. The Windows-based *Picture Publisher* performed ably on our tests, and the software driver provided by UMAX worked without a hitch. However, the software can be faulted on its Xchange window for close-up image manipulation, and it is sometimes difficult to use crop-

The UG80 owes its better-than-average image capture ability to its workmanlike scanning modes and capabilities.

ping guides, which are nearly invisible and hard to grab in the prescan window.

The scanner itself is a pretty plain package. The only surface controls are power-on, ready, and scanning-status LEDs; the on/off switch and the ports are on the rear of the unit. Mechanically, it works flawlessly, with one exception common to most scanners: If you attempt a scan before the scanning head has returned to the home or ready position, the unit freezes. So it pays to watch the LEDs if you are doing re-



UMAX UG80

UMAX Technologies Inc., 2352 Walsh Ave., Santa Clara, CA 95051; 800-562-0311, 408-982-0771.

List Price: With interface kit and *Picture Publisher* or *Image-In*, \$1,695; automatic document feeder, \$525.

Requires: 286-based PC or better, 1MB RAM, hard disk, VGA graphics adapter, DOS 3.1 or later, *Microsoft Windows* 3.0, mouse.

In Short: A solid workhorse, the UMAX UG80 yields above-average resolvability and quality gray-scale scans.

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NEC

GRAPHICS GRAY-SCALE SCANNERS

petitive scans. On speed alone, the UG80 performed some of the fastest scans at 150 dpi but slowed considerably when scanning full-page text and images at 300 dpi. This is entirely forgivable due to its virtually noiseless detailed sampling of the test targets.

Should mechanical or user problems develop, UMAX offers a toll-free technical support line, and its standard one-year warranty is enhanced by the offer of third-

party on-site service through Avery-Dennison Manufacturing for a \$95 fee.

Given the performance, features, solid construction, and mechanics of the UG80, it is a good purchase if you need a solid workhorse unit for scanning applications. The UMAX UG80 is a quality scanner for line-art and OCR applications at an attractive price.

XEROX IMAGING SYSTEMS INC. Xerox Datacopy GS Plus

by Wendy Dugas Pérez

Xerox, a name that has long been synonymous with copiers, also produces the Datacopy GS Plus, a flatbed scanner that almost lives up to the reputation of its relatives. While it does produce fast, quality output and has some good qualifications for OCR work, the limitations of the basic scanning software provided by Xerox leave you wanting more, while its uncompetitively high list price (\$1,995, or \$2,495 if you include the extra cost of *Gray F/X*, Xerox's gray-scale image editing software) leaves you wishing for less.

Installing this scanner is a snap. You simply insert the 8-bit SCSI card into a slot on your machine, cable the card to the scanner, and plug it in. You don't have to

Suitability to Task

Xerox Datacopy GS Plus

Black and white		2
Gray scale		2
OCR		2

worry about DIP switches or jumpers here. Installing the software is just as easy; simply execute the simple install program and you are all set. The optional \$595 automatic document feeder posed more of a problem, however, since Xerox did not include installation instructions. A call to tech support resulted in our receiving one page of installation instructions and one page of directions for using the document feeder, but that was it. These meager instructions failed to mention how to install the input and output paper trays.

THE TROUBLE WITH SOFTWARE

All of the hardware is sturdy and worked properly at the default settings. The proprietary scanning software is the real problem here. Xerox will provide different versions of its software that will run under DOS, Microsoft Windows 3.0, or OS/2, as well as the Macintosh operating environment, but the software is very basic and only allows you to scan in an image and see a pre-

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GRAPHICS

GRAY-SCALE SCANNERS

view with just an indication of sizing. If you want to see the quality of the scanned image or do any editing, you must use another package. Another major drawback is that you cannot do any calibration or scaling. Maybe this is Xerox's ploy to get you to shell out another \$495 for a copy of its own *Gray F/X*, which gives you a full range of image processing options, but competitors provide this capability for no extra charge.

Gray F/X allows you to scan black-and-white line-art and to perform dithered scans of continuous images, as well as supporting both 4- and 8-bit gray-scale scanning. It does not support the Xerox Datacopy GS Plus' 6-bit gray-scale scanning mode, however. The scanner gives you four dither patterns to choose from, as well as 256 simulated gray shades. You can also set brightness and contrast levels and use gamma correction.

TEXTUALLY TERRIFIC

The Datacopy's strength is its high-quality text output. Its scan of our text-page target tied for top honors in this roundup. This scanner's ability, coupled with its \$595 50-sheet automatic document feeder and

\$599 *Discover 386* OCR software, is good news for OCR users. There are a few notes of caution when using the feeder and *Discover 386*, though. For instance, after we scanned in our test document, we found pages on the floor as well as curled up in the output tray. The images we scanned in with the feeder came out almost perfectly aligned, so there was no major problem there.

The scanner's gray-scale and halftone output, though still good, was not as outstanding as its text output. On our color test target, the Datacopy washed out the yellows, and there was not enough of a range separating the light grays. Also, while our gray-scale original had fairly good detail in the dark areas, it lost detail on the highlights. Its output on the line-art resolvability test was about average. The scanner was competitive in all three timing tests, turning in above average times across the board. Its hardware warranty is only 90 days, though it does offer toll-free tech support.

Though its text scanning abilities are good, document feeder deficiencies make



Xerox Datacopy GS Plus
Xerox Imaging Systems Inc., 185 Albany St.,
Cambridge, MA 02139; 800-777-3520, 617-864-4700.
List Price: With interface kit, \$1,995; *Gray F/X*, \$495; automatic document feeder, \$595;
Discover 386 (OCR software), \$599.
Requires: 640K RAM, hard disk, EGA or VGA graphics adapter, DOS 3.0 or later, mouse.
In Short: The Xerox Datacopy GS Plus produces acceptable scans, but it is hampered by a high price and the poor quality of its bundled scanning software; *Gray F/X* software costs \$495 extra.

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the Xerox Datacopy GS Plus at best an acceptable choice for OCR work. Its high price and lack of good software make it a poor choice for gray-scale scanning. ■

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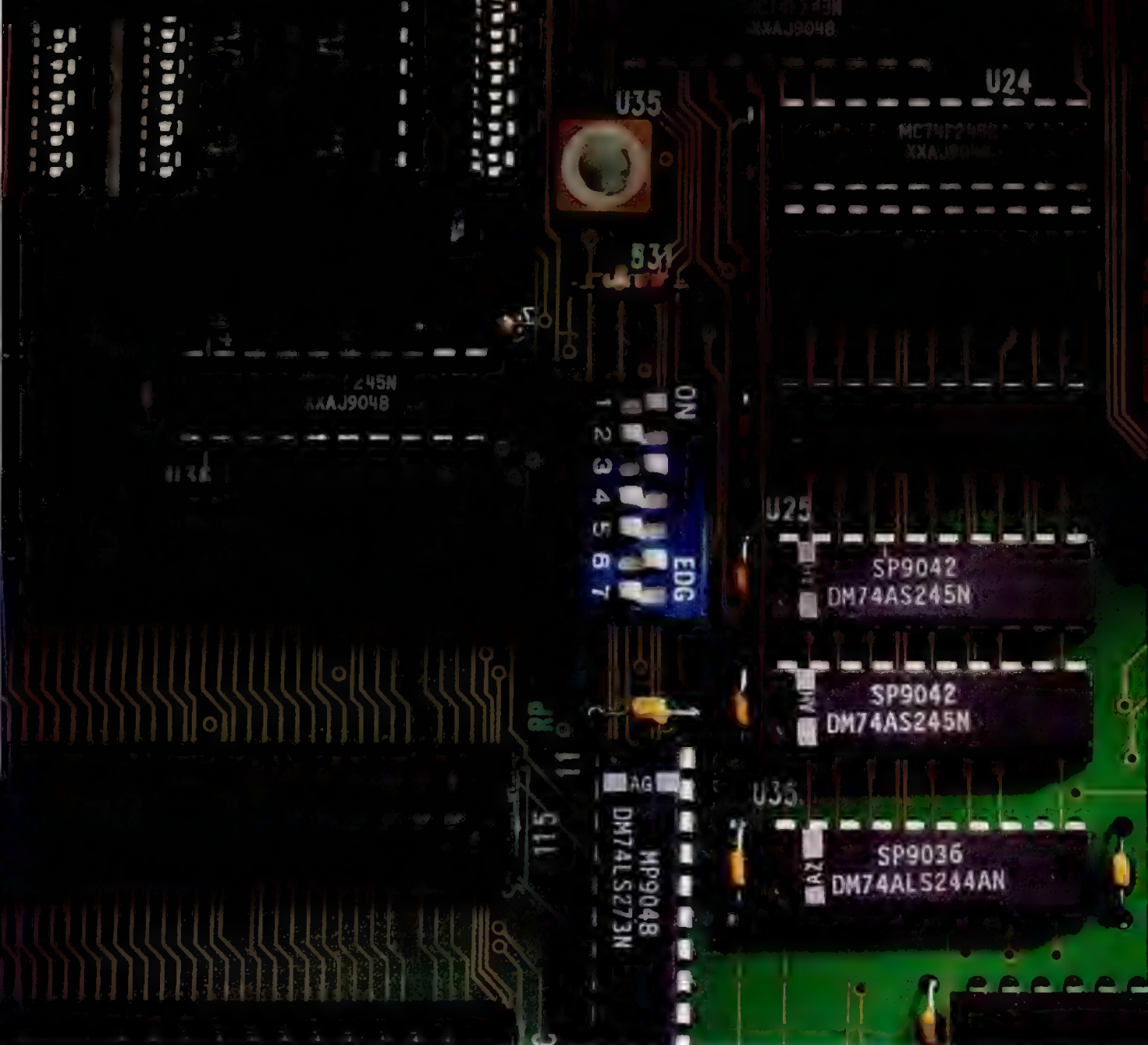
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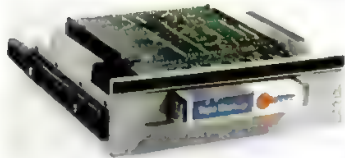
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ARTFUL ASSISTANTS

Three Graphics Utilities for Windows and PM

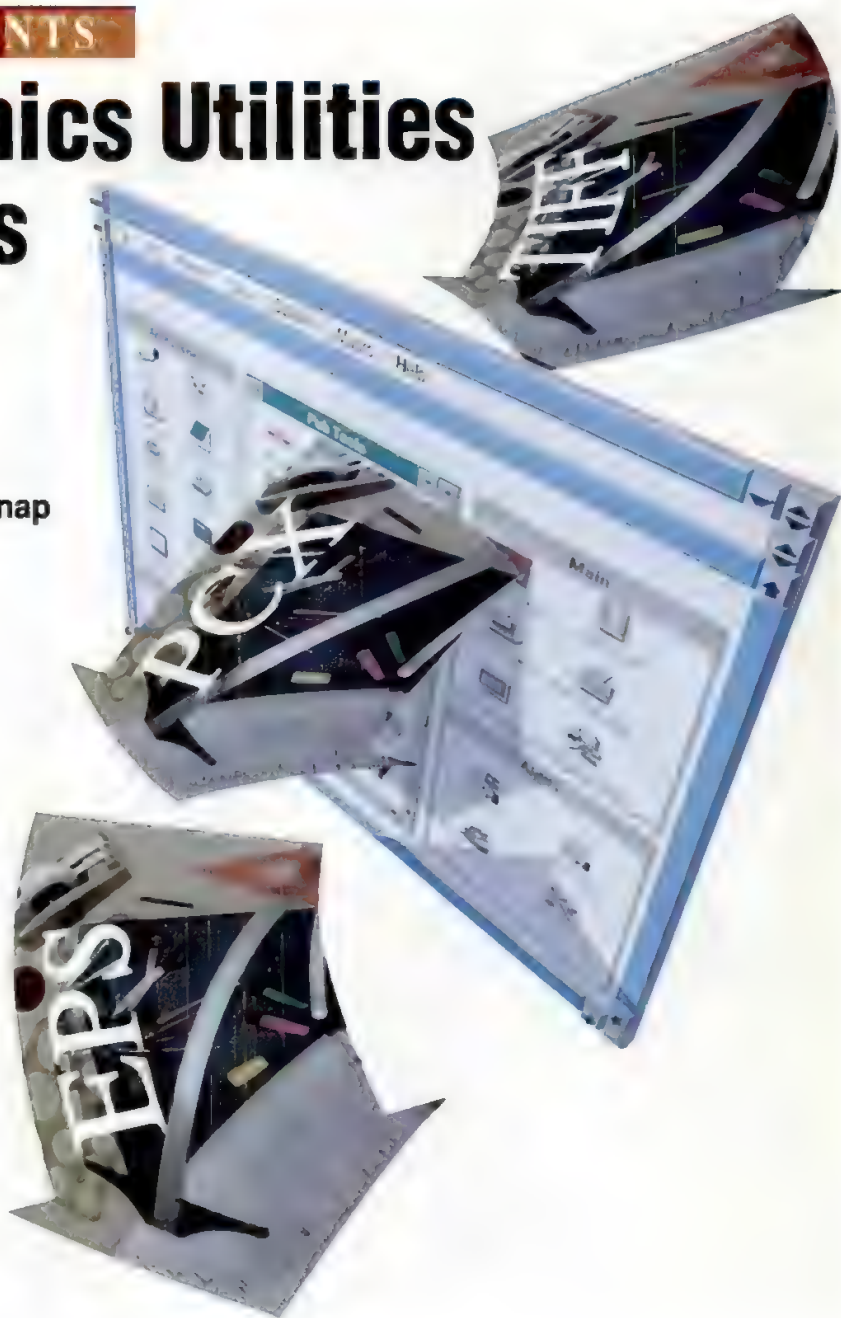
Windows and Presentation

Manager users often need to snap screens, convert graphics between formats, or reduce images to monochrome representations for printing. Here's a trio of utilities to help you with these day-to-day graphics chores.

by Paul Murphy

If you are a *Microsoft Windows* or *Presentation Manager* user, you have undoubtedly discovered that a WYSIWYG environment brings with it a host of graphics problems. Desktop publishers, for instance, need to import bitmapped pictures in various formats, then reduce them to gray-scale or dithered representations for laser output. Writers of training and reference materials need to capture screens and menus to illustrate their documents. And creators of slide shows and multimedia presentations need to convert graphics files from various sources into a common, workable format, to standardize palettes, and to reduce color images to fit the limitations of standard VGA monitors and color output devices.

Windows' own Paintbrush accessory is hardly up to all these tasks. In this article,



GRAPHICS GUI GRAPHICS UTILITIES

we review three graphics utility programs that can help you handle them. A fourth, *PictureEze* from Application Techniques of Pepperell, Massachusetts, was released too late to be reviewed.

DoDOT (\$149) and *ImagePrep* (\$295) are Windows 3.0 programs with wide-ranging support for color image processing. By contrast, *Collage PM* (\$199) provides a more basic set of graphics services under Presentation Manager—a critical necessity now that serious graphics programs such as *PageMaker* and *CorelDRAW* are starting to appear in that environment. All three utilities read and write

bitmapped graphics files in both TIFF and .PCX formats and can reduce color images to gray scales or dither them to monochrome representations. All of them also come with screen-capture modules that let you snap screens from within the Windows or PM environment and save them in a variety of bitmapped formats.

These programs are useful for basic handling of scanned images, but do not confuse them with full-blown image-editing packages such as Astral Development Corp.'s *Picture Publisher Plus* or U-Lead

Systems' *PhotoStyler*. Unlike those fancier programs, graphics utilities do not support scanners directly. And though they are capable of a limited degree of global image adjustment, they don't offer the sophisticated retouching and calibration features of their rivals. Nor do they have the pixel-level editing capabilities of paint programs like *PC Paintbrush IV* or Windows' own *Paintbrush* accessory.

MULTIPLE SKILLS

For many, the most immediately useful feature of these programs is their ability to capture screens. Though Windows has a built-in screen-capture mechanism (pressing PrtSc puts the current display on the clipboard), this is limited to capturing the full screen. Moreover, getting the image into the Windows Paintbrush and onto the disk without accidentally cropping it off can be tricky. And since the entire image must be held in memory, you may find yourself short of resources, especially if you capture 256-color screens.

The screen-capture modules in these graphics utilities bypass this problem by capturing screens directly to disk files. You can write screen captures out in several different file formats, converting them to gray scales or dithering to black and white in the process. In addition to snapping the entire screen, you can capture individual windows and dialog boxes or even crop a section from the screen.

The guts of these utilities are in their file conversion capabilities. *DoDOT* supports the widest range of common formats, including Windows' native .BMP format, CompuServe's .GIF, GEM (.IMG), MacPaint (.MAC), and WordPerfect Graphics (.WPG), as well as a range of .PCX and TIFF variants. But since it does not fully support 24-bit color TIFF images, it's not as suitable for color graphics work as *ImagePrep*, which not only supports the highest levels of the color TIFF standard but also converts high-resolution Targa image files. Both of these utilities also produce color EPS output for incorporating images into color publications. *Collage PM*'s capabilities are more limited: It imports only 8-bit variants of .BMP files and exports only gray-scale and monochrome TIFFs.

There's more to conversion than just switching formats, however. Though we tested the graphics utilities using Kodak Q60 test targets for professional color graphics, few applications can import 24-bit scanned images directly. Even if yours

GUI GRAPHICS UTILITIES: SUITABILITY TO TASK

While the reviews and Editors' Choice sidebar will give you a good idea of how these products stack up in general, the individual capabilities of the packages are not equal. Use these ratings together with the features table and the product reviews to help you match a package to the tasks that are most important to you.

THE TASKS



Screen capture is a measure of the flexibility of the program's Windows screen-capture module. The better programs let you capture individual elements such as windows, menus, and dialog boxes in addition to the whole screen. Richness of options (file formats, colors, and hotkey settings) are also taken into account.

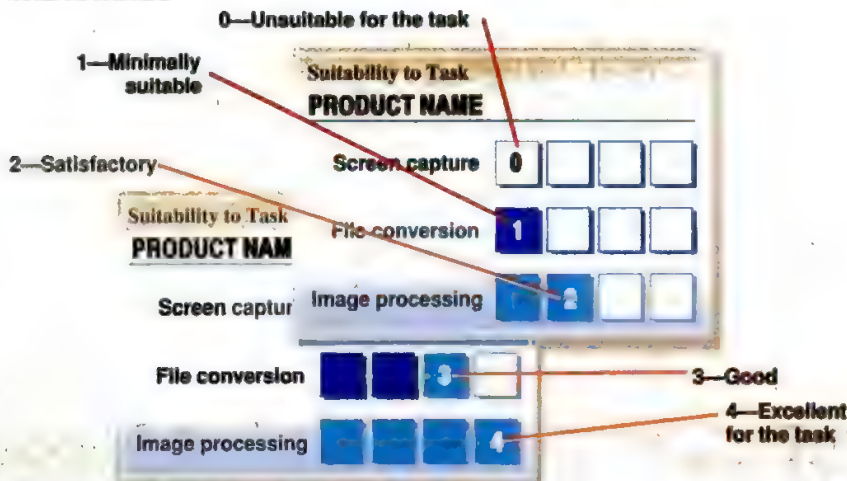


File conversion is a measure of the breadth and depth of the program's raster file conversions. All the programs support TIFF and .PCX. Extra points are given for different flavors of these formats and for additional formats such as GIF. Ease and speed of conversion also factor into the score.



Image processing is a measure of the program's strength in color reduction and adjustment. A satisfactory rating means the program can reduce color images, convert them to gray scales, and dither them to black-and-white patterns. A higher score is given for enhanced color-reduction and color-correction features.

THE RATINGS



A close-up, high-angle photograph of an Intel Zelos 386SX processor mounted on a green printed circuit board (PCB). The processor is a black, square integrated circuit with gold pins visible along its edges. The PCB is densely packed with various electronic components, including capacitors and other integrated circuits, all interconnected by a complex network of gold-colored traces. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the metallic textures and the intricate layout of the board. The overall color palette is dominated by the green of the PCB and the black of the processor, with metallic highlights in gold and silver.

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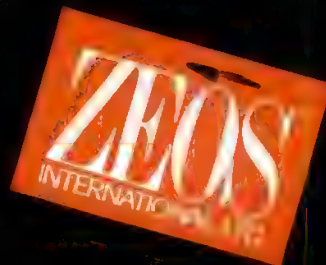
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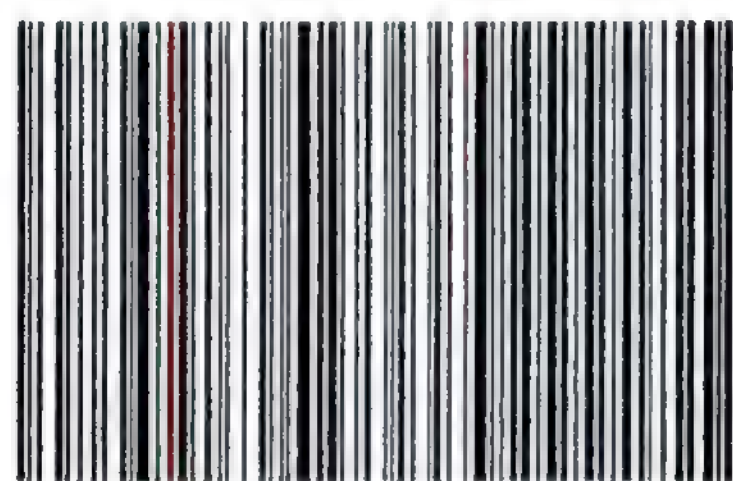
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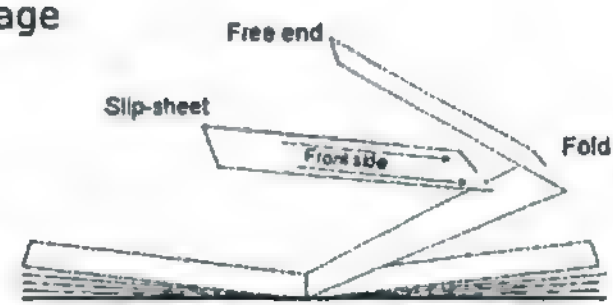
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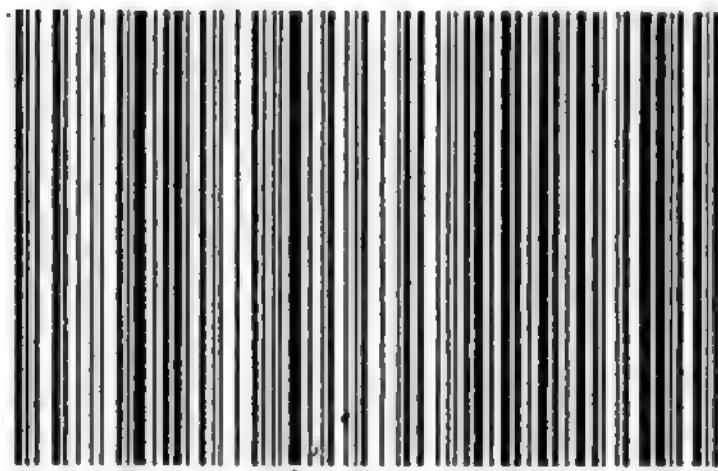
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Back

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That's right! Now you can own the incredible ZEOS 386SX-20 for as little as \$1195. The price is amazing but that's not all.

Should you decide to purchase it (and we think you will), you will be acquiring the most advanced personal computer system of its kind. Incorporating the very latest in personal computer technology, your new ZEOS 386SX-20 is quite simply the very best you can buy—at any price. Why?

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FAST MEMORY. INCREDIBLE PERFORMANCE.

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Until now, the best way to get data to a 20MHz processor was to use "cache memory"; the next best is called page/interleaving. Yet a typical cache scheme of say 32K (only 1/16 of a megabyte) holds only a fraction of the memory's data for quick crunching by the processor. The rest of the system's memory is usually only 80 nanosecond (ns) or even slower 100ns DRAM. That's where ZEOS' blazing *53ns memory* comes in.

With the 53 nanosecond memory in your new ZEOS 386SX-20, your system's processor has *instant access* to all the memory in your system—without using a cache. This instant access to *all* your system's memory means your data is available for immediate crunching. Bottom line—an *incredibly* fast computer at a *very* reasonable price.

INCREDIBLY FAST. JUST FOR STARTERS.

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10 Good Reasons To Buy From ZEOS®

Reason #1 "Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but *eight* times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2 Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

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Reason #3 Exceptional Quality.

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Reason #4 Value.

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Reason #7 Experience.

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ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8 A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

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**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

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Address _____ Apt. _____
City _____ State _____ Zip _____
Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____
Previous Address _____
City _____ State _____ Zip _____
Employer _____ Since? (Mo./Yr.) _____
Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____
Previous Employer _____ From - To _____
Occupation _____
Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.
Additional Monthly Income \$ _____ Source: _____
Name & Address of Nearest Relative Not Living With You _____
Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No
Savings Account ☐ Yes ☐ No

Y/N	How Many?	Y/N	How Many?
Bank Loan	_____	Dept. Store Charge Card	_____
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MasterCard	_____	Other Major Charge Cards	_____
Finance Company Loan	_____		

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____
Joint Applicant's Employer _____ Since? (Mo./Yr.) _____
Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

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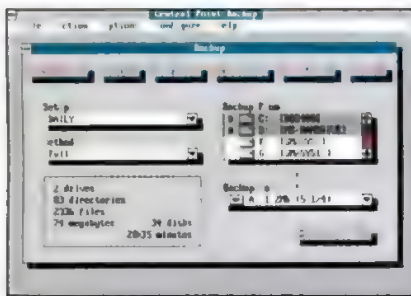
There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z-Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

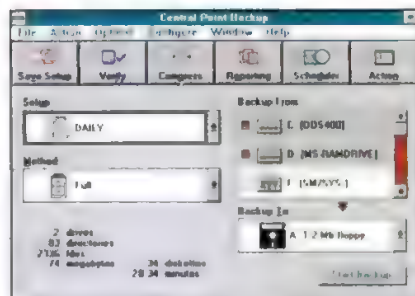
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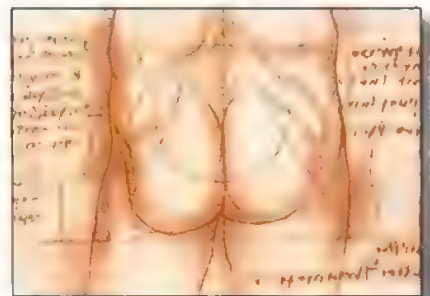
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can, the enormous size of such images makes it imperative to find ways of cutting them down to size (depending on its complexity, its dimensions, and its resolution, a 24-bit color image can easily take 20MB or more in disk space). For most practical purposes, you'll want to reduce the possible 16.7 million colors to a palette of 256 colors in such an image, or

even 16 colors for easier handling.

One method of color reduction is simply to match the colors as closely as possible to a fixed palette. This lets you avoid color surprises when importing the images into programs that use such palettes, like most presentation graphics programs. But the procedure works well only with simple drawings in which colors can be mapped easily. To handle scanned images with complex shadings, *ImagePrep* has a sophisticated algorithm that lets it create an optimized palette for any image, with colors selected as closely as possible to preserve the appearance of the original. This works particularly well for making 24-bit images look good in 256 colors. Such algorithms are also used to convert color images to gray-scale palettes.

Another useful color reduction method is dithering—the replacement of colors or shades with patterns to give the illusion of more colors or shades. All of these programs produce black-and-white images by using dither patterns to simulate shades of gray. And *ImagePrep* can create dithered color images as well—a technique especially suited to adapting scanned images to small (16- or 4-color) palettes. Dithering tends to coarsen the image, and some dithering methods work better than others on certain images. *ImagePrep* gives you a selection of dither patterns, so you can experiment to find the one that suits a particular image best.

MEMORY GAMES

Displaying large images requires a corresponding amount of memory. One big advantage of these programs over their DOS counterparts is their ability to take advantage of the advanced virtual memory management capabilities of *Windows* 3.0 and OS/2; these use the hardware facilities of the 286 and 386 microprocessors to overflow the images to disk when memory runs short. *DoDOT* lets you open multiple images, keeping them on temporary swap files on the disk, though with multimegabyte files you have to be wary about running out of disk space. *ImagePrep* uses the slower but safer method of drawing screen images directly from the source file, with only one file open at a time. *ImagePrep* is also notable for its ability to compress graphics files, but only those stored in its proprietary .CPI format.

Those who need only screen capture

will find several utilities especially for that purpose. Under *Windows*, the most thorough is Anderson Consulting and Software's *Tiffany Plus*, which lets you capture virtually any identifiable section of the screen and save it in a wide selection of current and outdated file formats.

Tiffany Plus lets you define several hotkeys, but its minimized icon appears on your screen shot unless you specifically hide it from view behind a window. For this reason, you may prefer the *Windows* screen-capture module included with Inner Media's *Collage Plus* for DOS, which simply disappears during the capture process, and which also offers a programmable countdown so that you can snap complex screens that take a while to redraw.

Several shareware *Windows* screen-capture programs are also available, and if you live in the Presentation Manager world, *Clip 'n Save* (from Dynalink Technologies) offers screen capture with a few twists, such as the ability to convert EPS files to Microsoft's Rich Text Format (RTF) for incorporation into word-processed documents with fonts intact.

As cross-media presentation and publishing become a greater part of your graphics needs, the format-conversion and color-reduction functions of these utilities are bound to play an increasingly important role in your work. If you plan to work with graphics, you should add one of these utilities to your basic toolkit.

Collage PM

Inner Media describes its *Collage PM* as "complete desktop image handling that anyone can use," but this proves to be an overstatement. Admittedly, this \$199 program provides Presentation Manager users with a reasonable alternative to the DOS compatibility box, and it is relatively easy to use. But its feature set is merely adequate.

Suitability to Task

Collage PM

Screen capture	2			
File conversion	2			
Image processing	1			

PC EDITORS' CHOICE

ImagePrep

The popularity of *Microsoft Windows* 3.0, the decreasing cost of color scanners and video adapters, and the increasing availability and quality of color output devices are bringing color graphics into the mainstream. One of the best utility purchases you can make to prepare for this new era is *ImagePrep*, our Editors' Choice.

A simplified rendition of Computer Presentations' *ColorLab* scanner software, the \$295 *ImagePrep* goes far beyond the call of duty in a graphics utility. It is solid in the basics: a versatile screen-capture module, the ability to convert to and from a good variety of standard formats, a rich variety of gray-scale conversions, and three separate dither patterns for black-and-white output. But what really makes it stand out are its color reduction and adjustment options: It can reduce 24-bit Targa and TIFF images to an optimized 256-color palette, it offers a range of color dithering options, and it even has a full set of global color corrections for adjusting color scans. Such facilities make high-resolution color images eminently practical to use in presentations, multimedia, and publishing.

ImagePrep's chief drawback is its lack of printing capability, but that deficiency should be remedied by the time you read this. By contrast, though *DoDOT* converts more formats and can open more than one file per workspace, its incomplete ability to support 24-bit color TIFF files closes the door to the most popular format for files from today's low-priced 24-bit color scanners.

Collage PM's ease of use is evident in the simplicity of its interface.

The program's ease of use is evident in the simplicity of its interface, which shows a list box for choosing files and a logical array of buttons to control conversion and display options. Although *Collage PM* can open files in the .BMP, .PCX, and TIFF formats, its default is .PCX; you must specify other extensions manually in the file search criteria. *Collage PM* supports Presentation Manager .BMP files, but you'll have to discover this ability on your own; the documentation does not list the program's import and export formats.

You will also discover that *Collage PM* supports only gray-scale and monochrome TIFF formats, leaving users with

color TIFF files out in the cold. In *Collage PM's* vernacular, 256-gray-scale images are called True Gray images, and it offers low-, medium-, and high-resolution dithers produced by Inner Media's proprietary dithering algorithms instead of the standard dither patterns. However, the resulting images are of high quality, and they can be displayed in a preview window with an adjustable viewport that includes a zoom option. (*Collage PM* also comes with a command-line Show utility that lets you view .PCX and TIFF files in the DOS compatibility box.)

WEAK IN OPTIONS

Collage PM's major failing lies in its skimpy set of options. You cannot reduce a 256-color image to 16 colors by palette optimization or dithering, though you can convert color images to 256 gray scales or 1-bit dithered monochrome formats. You can't make global color corrections, either, and though you can control the brightness of an image, you can't control the contrast. You can crop, flip, rotate, and



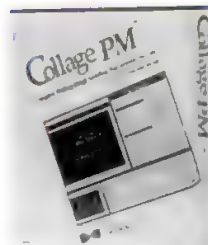
FACT FILE

Collage PM, Version 1.0
Inner Media Inc.,
60 Plain Media
Rd., Hollis, NH
03047; 800-762-
2949, 603-465-
3216.

List Price: \$199.

Requires: 286-based PC or better; 4MB RAM; EGA, VGA, or 8514/A graphics adapter; mouse; OS/2 1.1 or later.

In Short: *Collage PM* is a reasonable alternative to the DOS compatibility box for Presentation Manager users, but its feature set is adequate at best.

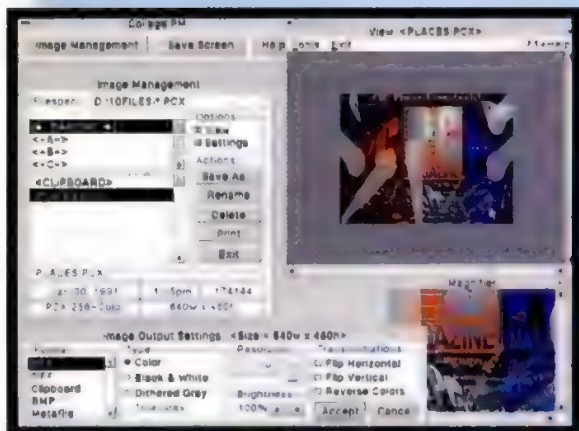


CIRCLE 413 ON READER SERVICE CARD

resize images in printing but not on-screen.

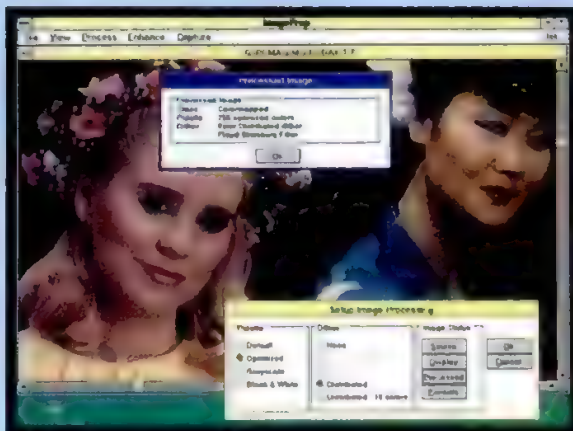
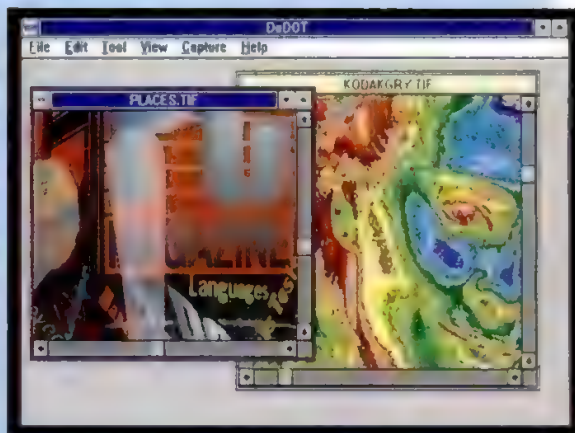
To our surprise, *CorelDRAW for OS/2* was unable to import any of the .PCX files that *Collage PM* created, though the *Windows* version of *CorelDRAW* opened the same files without incident. This may

A BUNDLE OF UTILITIES



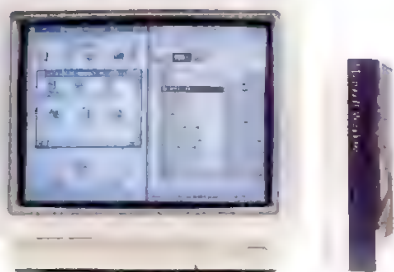
Collage PM translates color .PCX files, but it lacks color processing tools beyond simple brightness and contrast adjustments.

DoDOT can display multiple images simultaneously. But since the active image grabs the palette, underlying images may have their colors distorted.



ImagePrep's image-conversion dialog box gives you a look at the resolution and color characteristics of the source file, the target file, and your color display.

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...and are about to discover how to actually achieve it.



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Buy HP NewWave between 7/1/91 and 10/31/91, then send this coupon, original product registration card, and your sales receipt to HP Program Awards Center, P.O. Box 59058, Minneapolis, MN 55459-0058. Must be postmarked by 11/30/91

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Street address

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RECENT STUDIES SHOW WHO STORE VITAL DATA ON



It's no joke.

A survey conducted among computer users recently revealed that *half* of them have lost time and money because of accidental data loss.

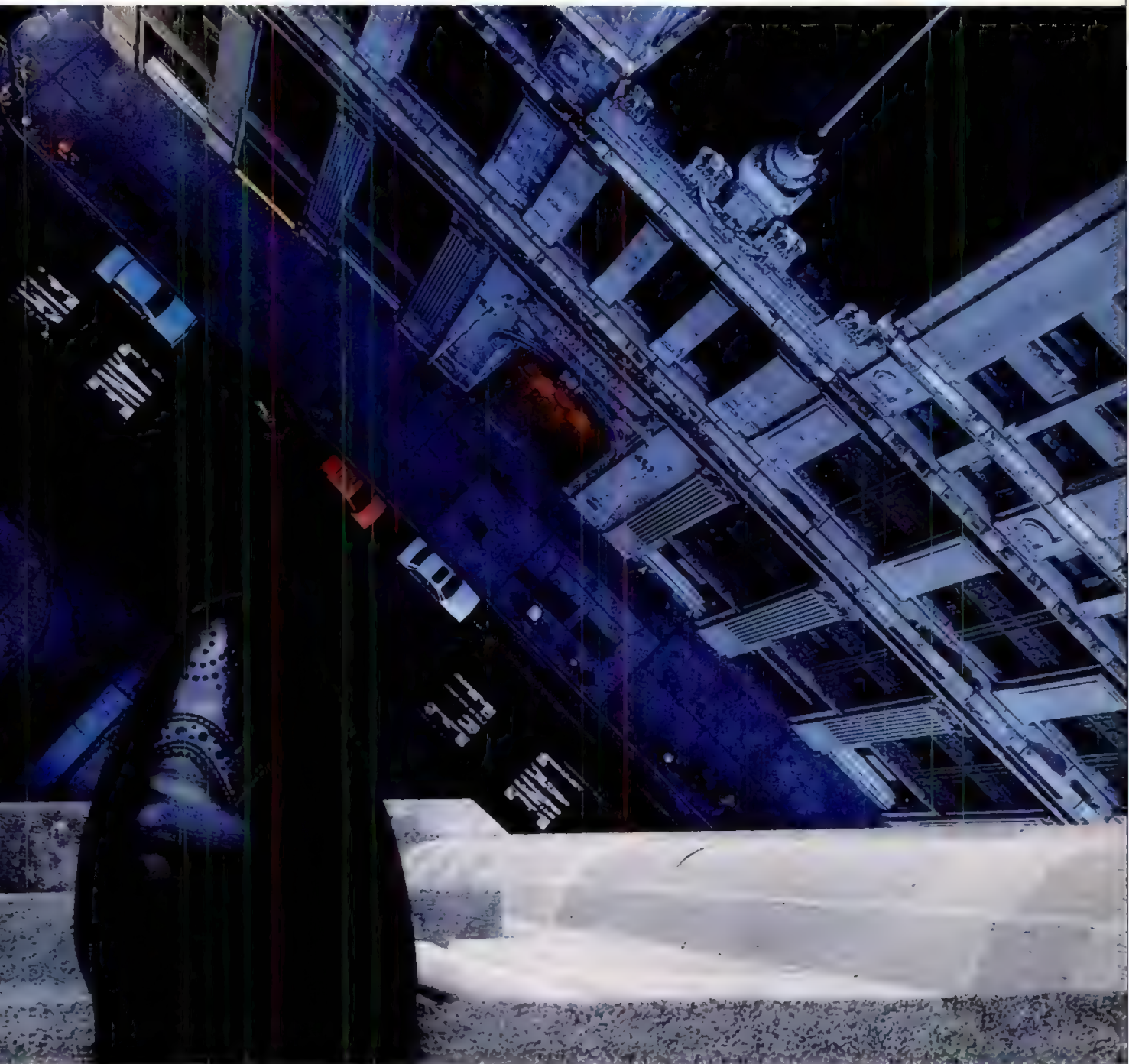
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THAT 50% OF THE PEOPLE DISKS ARE GOING TO LOSE IT.



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PostScript® language solutions for
LaserJet® printers haven't exactly
set records for speed.

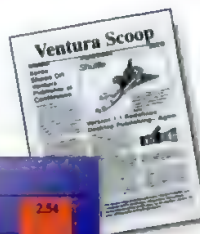
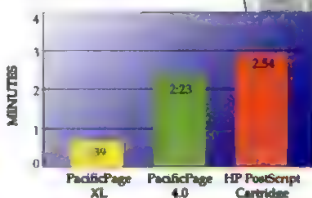
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changed.

In the past, patience has been a necessity when printing PostScript language quality graphics and text on your LaserJet IIP, III, IIID, or IIP laser printer.

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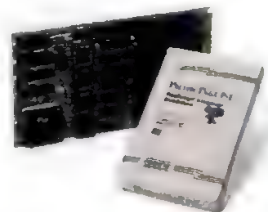
PacificPage XL provides the newest version of our PacificPage P•E cartridge and a high speed accelerator board that installs easily into the LaserJet's printer memory slot. It includes an Intel i960 KB RISC microprocessor and 2 MB of memory "on board". No additional memory is required.

Compare it to the Hewlett-Packard PostScript language solution. For their cartridge



and 2 MB of printer memory you would spend \$1085. While PacificPage XL sells for the low price of \$999 and produces output 2 to 8 times faster than the HP cartridge solution. And, PacificPage XL comes with a lifetime warranty and a money back guarantee of satisfaction.

If you're looking for a change of pace in PostScript language solutions for the HP LaserJet printer, call your nearest dealer or contact Pacific Data Products, 9125 Rehco Road, San Diego, California 92121, USA. (619) 597-4640, Fax (619) 552-0889.



PACIFIC
DATA PRODUCTS



All prices are U.S. list effective 2/15/91. For time comparisons, PostScript solutions installed on LaserJet III printer connected via parallel cable to NEC 386 25 Mhz personal computer. All printer times measured from hitting "Enter" key to engine start-up. PacificPage XL and PacificPage P•E are trademarks of Pacific Data Products, Inc. 960 is a trademark of Intel Corporation. PhoenixPage is a registered trademark of Phoenix Technologies Ltd. Copyright 1987, 1988 Phoenix Technologies Ltd. HP, LaserJet and Resolution Enhancement are registered trademarks of Hewlett-Packard Co. PostScript is a registered trademarks of Adobe Systems Incorporated. EUROPEAN HEADQUARTERS: Switzerland Tel (41) 22-412650, Fax (41) 22-410682. © 1991 Pacific Data Products.

GRAPHICS GUI GRAPHICS UTILITIES

indicate a problem with *CorelDRAW* for OS/2's import filters, but it bodes poorly for the idea of seamless image handling within Presentation Manager.

Collage PM is more useful as a screen-capture utility. Though the program can perform only full-screen captures, it displays each captured image in a viewer so that you can crop it before saving it to disk. *Collage PM* also features an audible countdown period, which you can manually adjust to give you time to position screen elements or to allow a complex screen to redraw. And the program disap-

pears automatically during screen capture, so you never have to hide an icon from view.

All things considered, *Collage PM*'s usefulness is limited by its lack of support for common file formats like .GIF, color TIFF, and .TGA, as well as by its environment. Though we can recommend *Collage PM* if you'll be doing a lot of screen capturing under Presentation Manager, you won't find it very useful for much more than that.

DoDOT

Halcyon Software's \$149 *DoDOT* has most of the makings of a great program for the ordinary *Windows* graphics user. It supports the widest range of graphics file formats among our three tested products, including *GEM* (.IMG), *MacPaint*, and *WordPerfect's* .WPG. It's also blessed with a good selection of gray-scale conversions and black-and-white dithering options. But it has gaps in its coverage of color graphics files that limit its usefulness somewhat.

DoDOT is unique among these three programs in its ability to display multiple graphics files, even those with different formats and resolutions, in separate windows. This is a great convenience for relatively simple files, but since the disk-based virtual image manager creates a temporary file in the specified directory for every file you open, you should be wary of opening several large files at once, as you can easily run out of disk

GUI GRAPHICS UTILITIES: SUMMARY OF FEATURES

Products listed in ascending price order

	DoDOT	Collage PM	ImagePrep
List price	\$149	\$199	\$295
GENERAL INFORMATION			
Interface	Windows 3.0	OS/2 PM	Windows 3.0
Colors supported	16.7 million	256	16.7 million
GRAPHICS FILE FORMATS (READ/WRITE)			
.BMP (device-independent bitmap):			
24-bit Windows	■/■	□/□	■/■
8-bit Windows	■/■	■/□	■/■
24-bit Presentation Manager	■/■	□/□	■/■
8-bit Presentation Manager	■/■	□/□	■/■
.GIF (CompuServe)			
	■/■	□/□	■/■
.IMG (GEM image format):			
Color	■/□	□/□	□/□
Black and white	■/■	□/□	□/□
MacPaint			
	■/■	□/□	□/□
.MSP (Microsoft Paint)			
	■/■	□/□	□/□
.PCX			
	■/■	■/■	■/■
.TGA (Targa)			
	□/□	□/□	■/■
TIFF:			
Color (RGB or indexed)	■/■	□/□	■/■
Gray-scale	■/■	■/■	■/■
1-bit (black-and-white)	■/■	■/■	■/■
Compression options:			
Packbit	■/■	■/□	□/□
LZW	■/■	□/□	□/□
WPG (WordPerfect Graphics)			
	■/■	□/□	□/□
POSTSCRIPT SUPPORT			
Write to EPS (color/gray-scale)	■/■	□/□	■/■
Use TIFF header	■	N/A	□
SCREEN CAPTURE			
Capture to file/to clipboard	■/■	■/■	■/□
Options:			
Whole screen	■	■	■
Active window	■	□	■
Dialog box	■	□	■
Pull-down menu	■	□	□
Partial screen area	■	□	■
User-definable hotkey	■	□	■
Autonumber screen shots	■	■	■
Insert borders around captured screens	□	■	□

PC—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

CONTINUES

Suitability to Task

DoDOT

Screen capture



File conversion



Image processing



FACT FILE

DoDOT, Version 3.0

Halcyon Software,
10297 Cold Harbor
Ave., Cupertino, CA
95014; 408-984-
1464.

List Price: \$149.

Requires: 286-
based PC or better,
1MB RAM, EGA or
VGA graphics
adapter, DOS 3.1
or later, Microsoft Windows 3.0. Mouse
recommended.

In Short: *DoDOT*'s wide range of file
conversions and its full array of screen-
capture options make it a good addition to the
average *Windows* user's toolbox, but its
support for 24-bit color files is imperfect.



CIRCLE 414 ON READER SERVICE CARD

ImagePrep

The increasing accessibility of 24-bit color graphics to ordinary users demands more than simple file conversion and screen capture. Computer Presentations' \$295 *ImagePrep* meets this challenge ably, with a good variety of file conversion options paired with excellent capabilities for processing color images.

ImagePrep both imports and exports

most major graphics files, with unique support for Targa and 24-bit color TIFF files. Its only real limitations in this area are fairly subtle: It doesn't write .PCX files of less than 4 bits per pixel, preventing you from saving dithered images in .PCX format, and it cannot write TIFF files compressed with the LZW or Packbit algorithms. Also, there are no facilities to help you find files, so you must know both the location and the format of your files in order to find them.

ImagePrep draws its screen images directly from the source file, so you don't

space. Displaying multiple images can also cause color distortions in all but the active image—an inevitable limitation of *Windows* and its built-in scheme for color palette management. Fortunately, *DoDOT* includes a manual screen-refresh command that redraws the active image using its own indexed palette, though it will not switch palettes on nonoverlapping images.

CAPTURE A PLUS

DoDOT has a fairly full set of screen-capture functions. You can capture virtually any area of the screen, including menus, by using an array of methods ranging from clicking on a window to capturing a framed area, in which the pixel dimensions are displayed interactively as you size the subject area. In addition, *DoDOT* can capture a predefined range of screen coordinates, which is a useful feature if you regularly need to collect data from forms or spreadsheets to use in reports or faxes. You activate captures with user-defined hotkeys or mouse actions, after which *DoDOT* minimizes itself to an icon, captures a screen, and either displays the captured image, saves it in one of many formats, or copies it to the clipboard or printer.

Yet the program falls down a bit when it comes to image processing and conversion, particularly in its lack of full support for color TIFF and Targa files. Though the documentation indicates that the program can use 24-bit images, this promise proved to be illusory on closer examination. A 10.2MB color TIFF test file displayed just fine, but a 15MB file refused to open. Halcyon confirmed that this problem was caused by the limitations of *DoDOT*'s existing code.

DoDOT also lacks tools for palette reduction, color dithering, or global palette standardization, though it does let you build, save, and apply palettes as you select colors with its "color picker" tool. Though this is really not practical for scanned images with subtle shadings, it can be useful for illustrations and line art with fairly simple color fills.

With wide-ranging support for common image formats and a full array of screen-capture options, *DoDOT* can more than earn its keep as a *Windows* graphics utility. But its lack of image-processing tools and the limitations of its color support may make you want to consider another program if you must often deal with color scans and other color TIFF files.

GUI GRAPHICS UTILITIES: SUMMARY OF FEATURES

Products listed in ascending price order

	DoDOT	Collage PM	ImagePrep
COLOR REDUCTION AND DITHERING OPTIONS			
Color reduction:			
To 256/16 colors	■/■	□/□	■/■
To 256/16 gray scales	■/□	■/■	■/■
To black and white	■	■	■
To selected/optimized palette	■/□	□/□	■/■
Dithering:			
To 256/16/4 colors	□/□/□	□/□/□	■/■/■
To 16/4 gray scales	■/□	□/□	■/□
To black and white	■	■	■
Dithering methods	Bayer	Proprietary	Bayer, Burkes, Floyd-Steinberg
GLOBAL COLOR CORRECTION			
Brightness/contrast	□/□	■/□	■/■
Color balance/white balance	□/□	□/□	■/■
Gamma	□	□	■
Black/white inversion	■	■	□
CONVERSION OPTIONS			
Convert between resolutions	□	□	■
Preview conversion before saving	■	■	■
Batch conversion	□	□	□
IMAGE TRANSFORMATIONS			
Crop	■	■	□
Flip horizontally/vertically	□/□	■/■	□/□
Rotate/scale/magnify	□/■/■	■/■/■ (in printing only)	□/□/□
IMAGE MANAGEMENT			
Workspace control:			
Pan	□	■	□
Zoom (fixed/variable)	■/■	■/□	□/□
Actual size/fit to window	■/■	□/□	■/■
Manual redraw	■	□	□
View multiple files simultaneously	■	□	□
Compress files	□	□	■
Print images	■	■	□
Scale to page	■	■	N/A
DOCUMENTATION			
Tutorial manual	■	■	□
Sample files	■	■	■
On-line help	■	□	□

PC—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

ENDS

DUE TO THE STRONG GRAPHIC CONTENT OF THIS PROGRAM, USER DISCRETION IS ADVISED.

NEW!
2.1 RELEASE
FREE
TRIAL SOFTWARE

We don't want to infringe on anyone's freedom of expression.

Limit the number of fonts used to no more than two per presentation. Be consistent and use underlines, italics or bold type for emphasis.

we felt a warning was necessary.

Once you try it, you'll understand why. Charisma's extensive word and data charting functions, real drawing capabilities and total user control make it the most complete graphics solution for business. Unfortunately, some people have trouble resisting the temptation to use every Charisma feature on every presentation. That's understandable.

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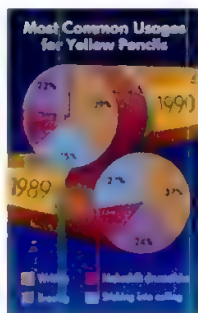
But Charisma gives you so many graphic possibilities in one powerful, Windows-compatible program,

into a bullet, it's easy to get a little too enthusiastic.

It's just as easy to get overly excited about the way Charisma lets you assemble entire presentations without switching between word processing, graphics and spreadsheet programs. Plus you see the results of your creativity immediately, since Charisma doesn't make you go back and forth between text and graphic



Add visual interest and keep audience attention focused with freeform illustrations or custom edited clip art. One graphic per chart works best.



Break out information logically and understandably with a variety of chart types. Then use the Harmony Palette for a unifying blend of just the right colors.

screens. And with more than 30 import and export filters for graphic formats—including Harvard Graphics—Charisma gives you more power and control than ever before.

But you shouldn't expect any less from a program designed specifically to take full advantage of the Windows environment. Now, even without overdoing it, you can output the most provocative business graphics you've



As you lay out word charts, use a template that provides maximum readability. Add spark to presentations by turning any graphic element, even your company logo, into a bullet.

ever seen to 35mm slides, overheads and handouts. Or make your point with SlideShow, Charisma's on-screen graphics presentation utility that includes dozens of transition effects. Its strong graphic content prompted *InfoWorld's* Michael J. Miller to say, "Charisma offers the greatest flexibility in creating and editing charts that I've seen."

We think you'll agree.

Call 1-800-733-3729, ext. 5050 (3710 in Canada) for your free working model of Charisma 2.1*.



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*Allow 4-6 weeks for delivery. Micrografix, Inc. 1303 Arapaho, Richardson TX 75081 • (214) 234-1769 (customers outside North America please dial extension 3710) Micrografix has offices in Los Angeles, Paris, London, Munich, Sydney and Copenhagen. Copyright © 1991, Micrografix, Inc. All rights reserved. Micrografix is a registered trademark, and Charisma is a trademark of Micrografix, Inc. All other products are trademarks or registered trademarks of their respective owners. All visual elements created with Charisma.

KEEPING TRACK OF YOUR GRAPHICS

by Barry Simon

If you use a lot of graphics, chances are you need an efficient way to organize them. A *Microsoft Windows*-based catalog can help make the task more manageable. The key to organizing your graphics is being able to make thumbnails, or small-size representations of the art that allow you to view entire libraries of images.

Eikon Systems' *Scrapbook Plus* (\$149.95), the granddaddy of clipboard enhancers, allows you to create catalogs of files in a variety of different graphical and text formats. You can import files from disk or from the *Windows* Clipboard; the program supports a wide range of formats, including bit-mapped files (.PCX, *Windows*' .BMP, .MSP, and TIFF), vector graphics files (CGM, EPS, Micrografx .DRW, and .WMF) and data files (ASCII, Rich Text Format, SYLK, and .DIF). When you create a library, the program saves the complete graphic or text item and also makes a black-and-white thumbnail of the image, sized so that you can see up to 40 at once. You can assign each item a one-line description, and you can search on the descriptions.

Publishing Technologies' *PubTech Multitack* (\$149.95) takes a different approach. The *Windows 3.0* version of this program (which we saw only in prerelease form) lets you place your thumbnails in piles and view multiple images at full size for better organization and comparison. To move clip art from its catalog to another application, you just drag it from the *Multitack* window into your application with the mouse.

Multitack's slick toolbox and color thumbnails make it a flashier package than *Scrapbook Plus*, but the comparison is not completely one-sided. *Multitack* lacks its rival's keyword search capability, although it does let you sort on a single title. And *Multitack* supports a more limited range of file formats. Both *Multitack* and *Scrapbook Plus* include screen-capture utilities, however, and can be configured to save the clipboard's contents to the active

catalog automatically whenever the clipboard is overwritten.

BY NAME ALONE

Image-In Album (available as part of *Image-In* or as a standalone package for \$99) uses a different method of clipboard transfer. While the other programs paste the full graphic to the clipboard, this program pastes only the filename. Fortunately, that is all you need for *PageMaker*'s Place command or *Word for Windows*' Insert Picture command. Like the others, this program displays thumbnails, but it also allows you to assign up to 16 different keywords to each picture.

Image-In Album currently supports .PCX (black-and-white only), .MSP, TIFF (black-and-white or gray-scale), *MacPaint*, Lotus .PIC, .WMF, and Micrografx's old .PIC format. (A future version will support EPS files as well.) Since you can't view graphics at full size or display more than four thumbnails at a time, however, browsing the program's catalogs is not as efficient as it could be.

If you own hDC Computer Corp.'s *FirstApps* (\$99.95), you'll find in the Art Gallery a very serviceable if limited scrapbook utility. This module lets you make catalogs of .BMP and .WMF files by pasting them from the *Windows* clipboard. You can display up to eight thumbnails at a time and paste them back to the clipboard. But there is no search capability within catalogs, so the program is useful primarily for organizing small collections.

Keep in mind that this area is not yet mature. *Scrapbook Plus* is actually a *Windows 2.1* application; marked for use with *Windows 3.0*'s protected mode, it does not take advantage of that version's other features, such as device-independent color bitmaps. The

Windows 3.0 version of *Multitack* was undergoing beta tests at the time of our review, and *Image-In Album* is scheduled to be upgraded substantially during the coming year. So you may want to wait for future versions of these utilities.

FirstApps

hDC Computer Corp., 6742 185th Ave. NE, Redmond, WA 98052; 206-885-5550.

List Price: \$99.95.

CIRCLE 409 ON READER SERVICE CARD



Eikon Systems' *Scrapbook Plus* helps you keep track of your graphics by cataloging them in thumbnail form.

Image-In Album

Image-In Inc., 406 E. 79th St., Minneapolis, MN 55420; 612-888-3633.

List Price: \$99.

CIRCLE 410 ON READER SERVICE CARD

PubTech Multitack

Publishing Technologies Inc., 7719 Wood Hollow Dr., #260, Austin, TX 78731; 512-346-2835.

List Price: \$149.95.

CIRCLE 411 ON READER SERVICE CARD

Scrapbook Plus

Eikon Systems, 989 E. Hillsdale Blvd., #260, Foster City, CA 94404; 415-349-4664.

List Price: \$149.95.

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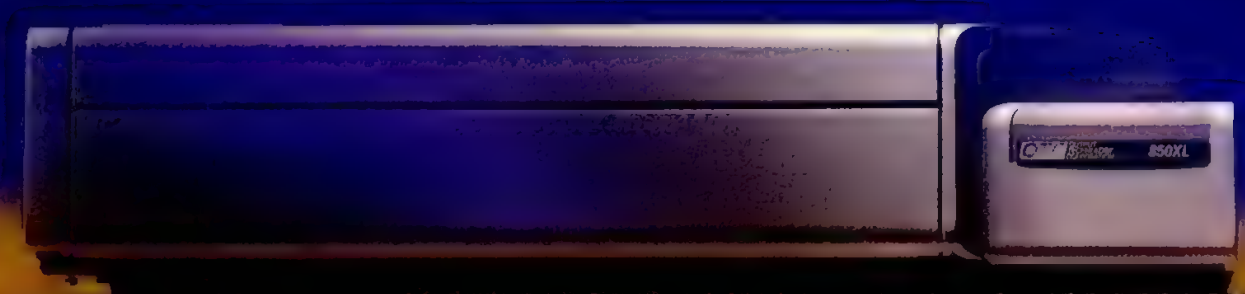


THE ROOM
XL
HARDCARD II XL



1 Typical application access time using Discache® 2 As measured by Power Meter on a Compaq Deskpro 386 33MHz system
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CIRCLE 245 ON READER SERVICE CARD

GRAPHICS GUI GRAPHICS UTILITIES

need to have large areas of free disk real estate available to display huge 24-bit images. The tradeoff is the slowness of screen redraws when scrolling. The screen image is read from the disk, often through dithering and palette filters, so screen redraws can be frequent and sluggish enough to be annoying. Any time a menu or dialog box covers a portion of the image, for instance, that portion must be redrawn. *ImagePrep* will not knock you out with its screen-capture functions, but it does have a solid, usable set of them, including user-definable hotkeys and the ability to save captures in multiple formats.

POWERFUL COLOR REDUCTIONS

ImagePrep's rich image-conversion and palette-reduction features are a snap to use. Conversion options are displayed together in a single dialog box, which also gives you an immediate look at the resolution and color characteristics of the source file, the screen display, and the current target conversion. *ImagePrep* lets you adjust brightness, contrast, RGB,

color balance, and gamma settings through menu commands. And you can compress images in Computer Presentations' proprietary .CPI format using a proprietary compression algorithm. You can achieve compression ratios of up to 20 to 1, though some image degradation was apparent at higher levels of compression.

ImagePrep's Optimized Palette Reduction (OPR) algorithm is perhaps the easiest way to reduce a color image from 16.7 million colors to a palette of 256 or 16 colors. By first creating a histogram of the image's RGB values, *ImagePrep* assigns the 256 or 16 most used colors to a new indexed palette for the image. It then redraws the image using one of three possible dithering patterns (Bayer, Burkes, or Floyd-Steinberg), which you can also use when converting color or gray-scale images to black and white. All these conversions work independently of the display device, so a 256-color image can be converted to a true color Targa file even if you are using a Super VGA display. Although you can't directly reduce 256 color images to a 16-color palette, it's easy to save the 8-bit image in a 24-bit format and then perform the palette reduction.

ImagePrep won't overwhelm you with its screen-capture functions, but it does provide a good array of window-capture functions, and it includes user-definable hotkeys and the ability to save captures in multiple formats. Unfortunately, the program has no print functions at all—a major omission that forces you to export your images into .BMP or .PCX format and import them into *Windows*' Paintbrush in order to get hard copies of your pictures. By the time you read this, Computer Presentations should be shipping Version 4.0 of *ImagePrep*, which will let you cut and paste images to the *Windows* Clipboard and also rotate, scale, and print images. This will only improve its value. Meanwhile, its solid conversions and screen-capture functions make this package a worthwhile investment. Though you may not need all of *ImagePrep*'s most sophisticated image-processing features now, they will certainly come in handy in the future.

Paul Murphy is a partner in Singer-Murphy Associates, a New Jersey land surveying firm, and a frequent contributor to PC Magazine. Barry Simon is a contributing editor of PC Magazine.

Suitability to Task

ImagePrep

Screen capture



File conversion



Image processing



FACT FILE

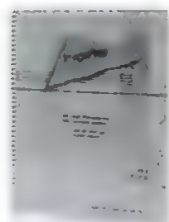
EDITORS' CHOICE

ImagePrep,
Version 3.1
Computer
Presentations
Inc., 1117
Cypress St.,
Cincinnati, OH
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by
Winn L. Rosch

Lab Notes

When you switch your PC on, you don't normally expect an electrical jolt to set your heart fibrillating, your soul trembling, and your coworkers covetously eyeing your window office. Nor do you think of your workstation as a potential flamethrower—a time-release Molotov cocktail whose seemingly innocuous circuit components could explode into miniature fireballs and spark an office conflagration.

But why should you repose such faith in the safety of your PC? After all, nothing about modern electronic equipment is inherently safe, and there are voltages inside your PC and its peripherals that are quite sufficient to electrocute you or to kindle a blaze on your desk.

If you have cause for confidence, it does not lie in the ponderous processes of regulatory agencies or in the reputation of an electronics industry whose color TVs once ignited apartments faster than you could say "instant on." It lies instead in two encircled letters you should hope to see on the rear panel of your PC: UL.

That stylized UL trademark means that a corps of independent safety engineers at Underwriters Laboratories has painstakingly examined both the design and a sample unit of the product and determined that it conforms to stringent safety standards. It also means that to ensure that production changes don't compromise the safety of your PC's initial design, other UL engineers will be conducting spot checks on random samples from the assembly line.

Just who are these experts? Why do they go to the trouble of checking equipment? What standards do they insist be met before authorizing use of that comforting UL logo?

PRIVATIZING SAFETY

Underwriters Laboratories is neither a government agency nor the child of a sixties-vintage, publicity-hungry, consumer safety advocate. Rather, it is an independent, nonprofit commercial business that simultaneously functions as a safety-engineering consulting firm and as a certifying

Will Your Next PC Meet the Standards For UL Approval?

■ In this Lab Notes, you'll learn how Underwriters Laboratories tests products for safety and how much it adds to the cost—and the value—of your PC.

organization. UL earns its livelihood from manufacturers who pay for its services in detecting what's wrong with their products before they hit the market. The power of the UL arises solely from its standards and its long and honorable reputation.

The organization goes back almost as far as commercial electrical power itself, well before the age of government regulations, consumer organizations, or even Upton Sinclair's exposés. Founded in 1894 by William Henry Merrill, the UL was first known as the Underwriters' Electrical Bureau, and it concerned itself primarily with product safety testing for the fledgling electric industry. The original organization comprised three people: Merrill, Edward Teall, and W. S. Boyd, and it was appropriately housed above a fire station in Chicago.

Formally incorporated as Underwriters Laboratories in 1901, the company has since expanded in staff (the roster now totals thousands), in offices (four: one each in Northbrook, Illinois; Melville, New York; Research Triangle Park, North Carolina; and Santa Clara, California), and in product areas. On its own responsibility UL now sets standards for and tests nearly any product about which there may be

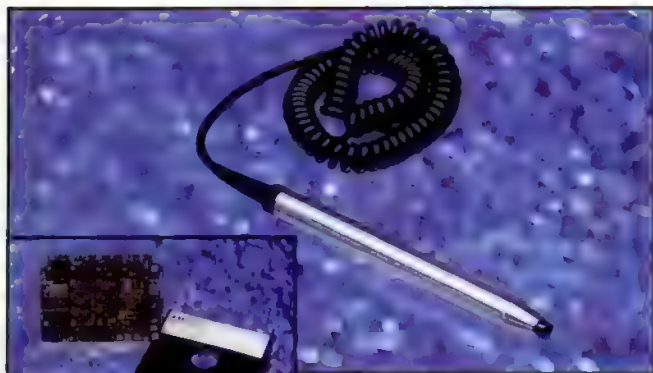
safety concerns, from PCs to space heaters and fire extinguishers.

Although the creation of a private business, Underwriters Laboratories' standards can and sometimes have acquired legal significance by being incorporated in statutes and ordinances. For example, the National Electrical Code, which has been made part of the laws of numerous municipalities, specifies that as of July 1, 1991, any equipment intended to be connected electrically to a telecommunications network must be listed for that purpose. (National Electrical Code, Article 800-51, subparagraph i.) Thus, in communities that enforce the national code, your PC *must* be properly listed if it contains a modern you intend to connect to a telephone line. A UL label on your PC would meet the listing requirement.

Because Underwriters Laboratories is not vested with governmental authority, however, it cannot force any company to follow its standards. It relies instead on cooperation and contract. In order to display the UL logo, a company must enter into a contract with Underwriters Laboratories that in effect licenses the use of the trademarked symbol.

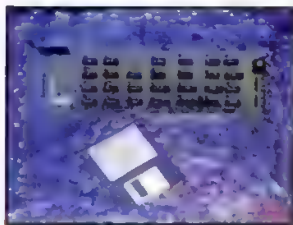
Underwriters Laboratories does not simply grant a license upon payment of a fee. To earn the right to use the logo, a company must agree to follow UL standards. More importantly, the company must submit a sample of the equipment to Underwriters Laboratories so that it can be tested and certified to conform with the standard. The contract also imposes an obligation on the manufacturer to continue to conform with the standard and gives UL the right to check compliance.

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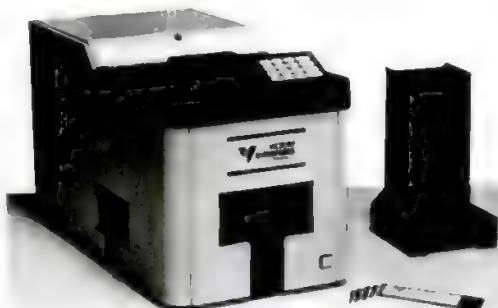
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Lab Notes

THE NEW PC STANDARD

In the 10 or 15 years before 1989, the UL standards that applied to data processing equipment were UL 478 (information-processing and business equipment) and UL 114 (office appliances and business equipment). The new UL 1950 standard applies to all information technology equipment and replaces both previous standards. First published on March 15, 1989, UL 1950 becomes effective March 15, 1992. After that date all PCs must meet this standard to be sold bearing the UL logo. Computer equipment now being made is tested for conformity with UL 1950 specifications.

The new standard represents an attempt

Be on your guard if a company says its PC is "UL recognized"—the UL does not give recognition to complete computer systems.

to unite various standards already in use by similar (but unaffiliated) national organizations, such as the Canada Standards Association (CSA) and the German Verband Deutscher Elektrotechniker (VDE). This means that manufacturers can follow a single standard instead of several (perhaps conflicting) standards in producing equipment to be used in Europe, Canada, and the U.S.

UL 1950 covers everything from ordinary desktop PCs and their peripherals (disk drives to printers) to mainframe computers. It even extends to simple desktop calculators and typewriters. Special standards with different requirements cover industrial computer devices that may have to operate in severe environments, such as those containing explosive fumes.

The inch-thick UL 1950 document covers nearly all aspects of equipment design and construction and outlines the testing

Lab Notes

procedure that Underwriters Laboratories applies. These range from insulation and wiring to mechanical strength and fire resistance. Even relevant markings and identifications on the product are covered. If you're interested, the complete copyrighted publication can be ordered directly from Underwriters Laboratories.

RECOGNITION VERSUS LISTING

In approving electrical devices, Underwriters Laboratories uses three strictly defined terms: *recognition*, *listing*, and *classification*. The standards for each of these are different and they apply to different kinds of devices.

Recognition represents approval of an electrical component; that is, it applies to products that are not complete in themselves but are part of a complete product. Light switches and computer power supplies are typical of equipment that can earn UL recognition. UL-recognized devices are entitled to display a special symbol: a slanted letter U and backward R (for recog-

THE DIFFERENT UL SYMBOLS



Figure 1: The UL-listing logo (left) is applied only to complete products. It should not be confused with UL recognition (right), which is limited to components not intended for end-user sale.

nition) combined together, as shown in Figure 1.

Listing applies to complete products that you can buy—an entire appliance, monitor, or computer system unit. Listed products are allowed to wear the familiar UL trademark, also shown in Figure 1.

Although a UL-listed product is often made from UL-recognized components, it doesn't have to be. Nor does the use of UL-recognized components automatically confer a UL listing on the finished product. The reason is that a UL listing means that a product is safe for use *in the form in which it is delivered* to you. UL recognition means only that the component is safe

when installed and used properly. The listing lifts the responsibility from you.

A UL-recognized component might be safe in itself, but could still be installed in a product in such a way to make it dangerous. For example, a heat-generating power supply could be shoehorned into a tight case that lacks adequate ventilation, leading to overheating and fire potential. Although the power supply was UL recognized, such a dangerous complete assembly would not achieve UL listing.

You should be on your guard if a company tells you its PC is "UL recognized." It cannot be. The UL does not give *recognition* to complete computer systems.

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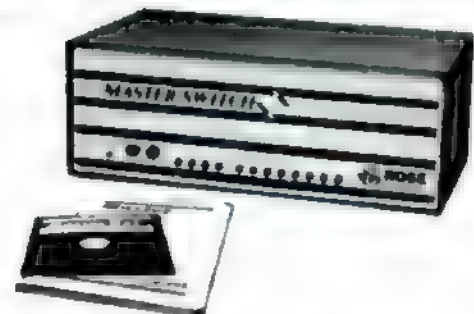
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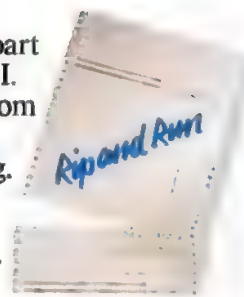
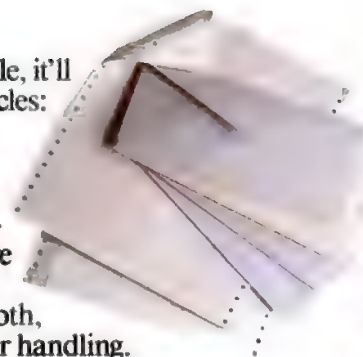
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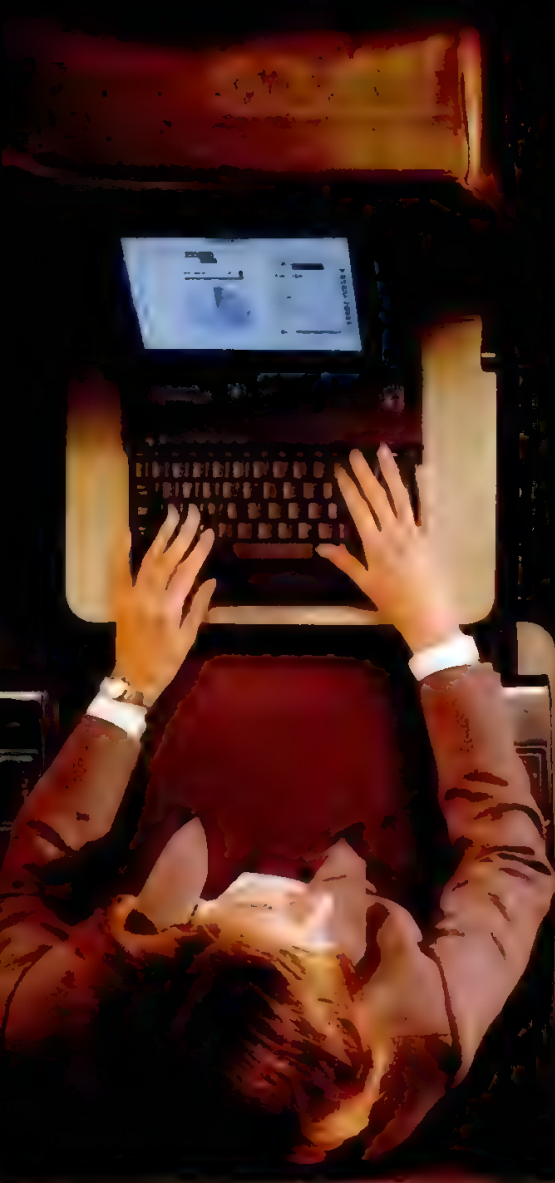
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A manufacturer may claim both that his computer is built from UL-recognized components and that it doesn't need to be listed. There's nothing wrong with either claim, but the implied "therefore" between them is misleading. Since UL listing is not a legal requirement, no one's computer *needs* to be listed. But since listing is applied only to complete products, even if every nut and bolt in the machine were UL recognized, you would still have no assurance that the system complied with UL design and manufacturing standards. A PC is UL listed or it is not. Period.

UL classification generally applies only to commercial or industrial (as opposed to consumer) products. Underwriters Laboratories tests such products to verify that they conform with specific published standards or regulatory codes and that they perform under specified conditions; it also determines whether these products pose specific hazards.

A UL-classified device bears no specific symbol but instead may be marked with the UL name and a statement indicating the extent of the classification of the product. For the most part, UL classification has no relevance to consumer PCs.

EARNING THE STAMP OF APPROVAL

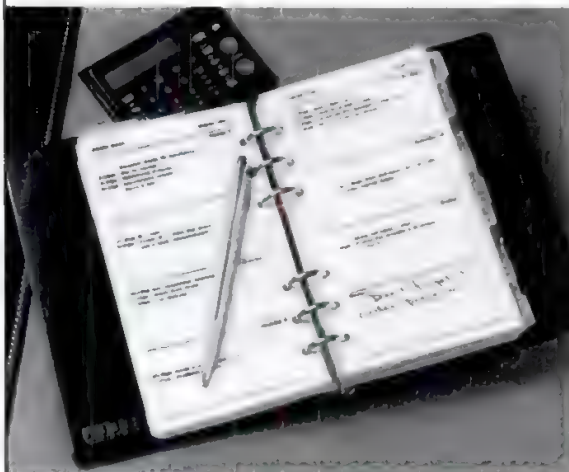
Getting a device UL listed, recognized, or classified is a multistep process, as the diagram in Figure 2 shows. It begins when the manufacturer voluntarily contacts Underwriters Laboratories. This first step can be a simple letter or phone call. The manufacturer then follows up by submitting a formal request for testing, together with a product description, photos, instructions, brochures, and whatever else would be helpful in showing UL exactly what the equipment is.

From this information Underwriters Laboratories determines which standards the product must meet and what tests will be necessary to assure compliance. It then notifies the manufacturer of the testing requirements, including the number of samples required and the cost. If the manufacturer agrees, he sends an application, a deposit, and the samples to UL, which then examines and tests the product.

If the product passes, UL issues a final report and sends the manufacturer notice of the listing of his product. Arrangements are made for follow-up procedures, in-

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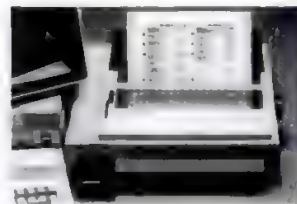
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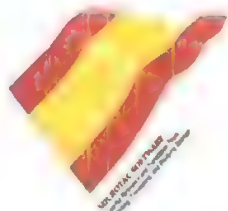
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cluding spot-checking of production. The manufacturer is then authorized to use the UL mark on the product and in its brochures and advertisements.

If the product fails, UL notifies the manufacturer of the results and suggests changes necessary to pass the tests. The manufacturer can then make design corrections and resubmit his product.

TRIAL BY FIRE

Underwriters Laboratories approaches each product to be tested in a methodical way. In general, the testing procedure begins at the outside and works its way in.

The starting point is the power cord. UL engineers make sure that the power cord itself is suitable to the application—that it can carry enough current without overheating and that it is tough enough to withstand your treading upon it.

From there, UL safety engineers turn their attention to the case. Plastic cases are especially rigorously checked. These must be strong enough to withstand normal abuse, including impacts and hot environments. After all, if the case breaks, you could injure yourself on the pieces or by accidentally touching the circuitry inside.

Flammability is another concern. Plastic cases must not contribute to the propagation of fires, nor should they give off toxic fumes. These tests involve the classic trial-by-fire—in effect setting a torch to the PC being evaluated.

Even the ventilation holes in the case are checked. Here the engineer has several concerns. Ventilation slots must be large enough to allow sufficient airflow to prevent the device from becoming overheated, but at the same time the holes must be small enough so that you (or your child) can't poke a finger through and get a shock. Openings must also be located in such a way that nothing can fall inside and create a short circuit or fire.

Inside the case, electrical power is the principal concern. The UL engineers measure the voltages that are present not only when everything is operating normally, but also under fault conditions—such as would occur if something fell into the computer and short-circuited the output of the power supply. Isolation between the power and logic circuits also is verified in order to ensure, for example, that you won't be hit with a shockingly high voltage if you should grab

the connector to unplug your printer.

Equipment is also tested to determine how hot it becomes under worst-case operating conditions. In the case of a PC, that means that all of its expansion slots and drive bays are filled so the maximum load is put on the power supply and cooling systems. The PC (or other device) is then run until its temperature stabilizes, and the internal temperatures are measured. The primary concern is that excess heat will cause

degradation of components, which could lead to fire or shock.

The amount of current the equipment actually draws is measured so that you know exactly what your electrical outlets will be called upon to supply. UL also performs a leakage current test so that you can be sure that if you lean against the case of a PC with your feet in a puddle, there won't be enough current to give you a shock.

In addition, a dielectric voltage test is

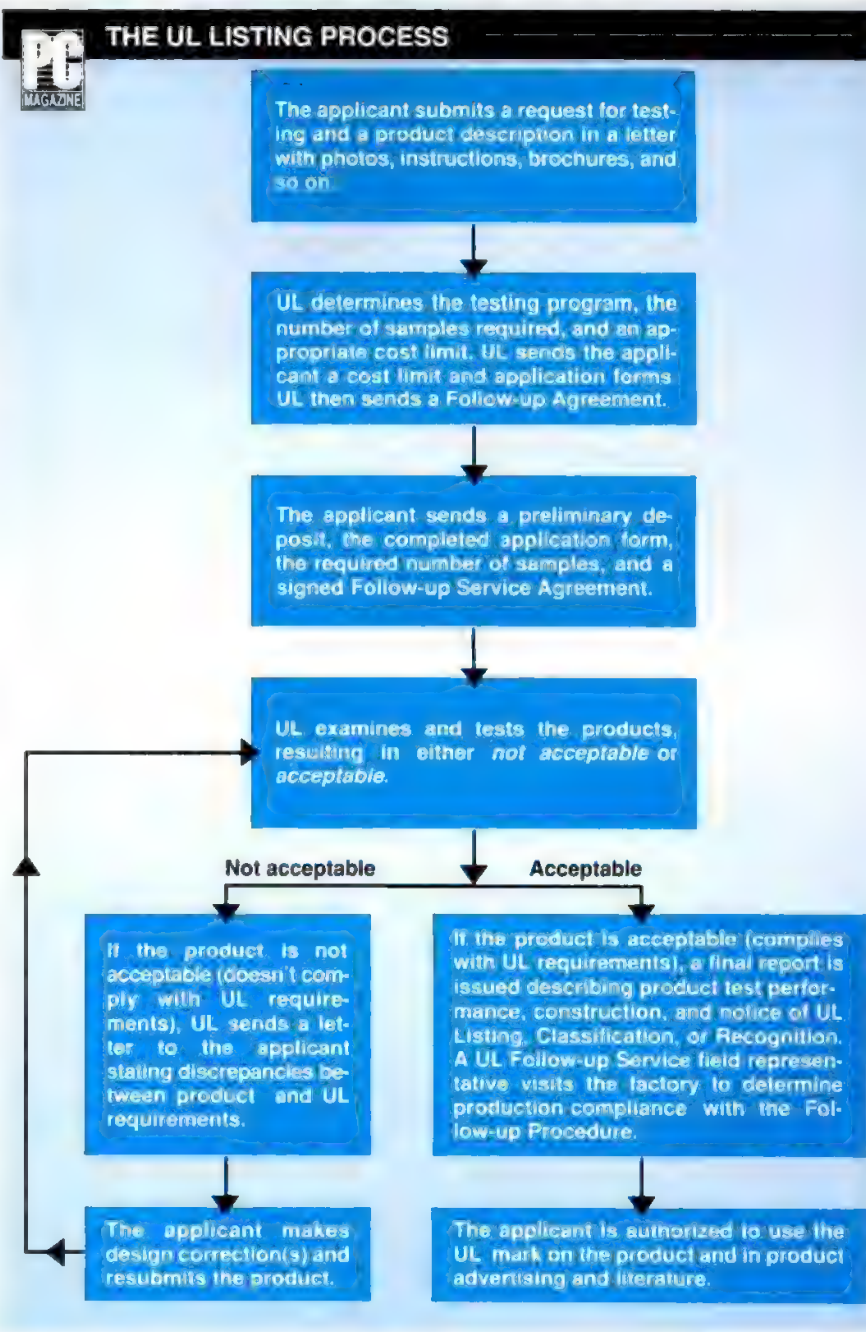


Figure 2: Whether you just have an electrical component or a complete computer system, here is the typical submission process for getting UL approval.

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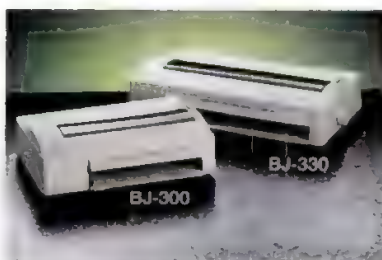
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performed. The dielectric voltage is the difference in electrical potential at which an insulator breaks down—that is, stops insulating. The dielectric voltage test verifies that the insulation in the computer is sufficient to protect you from electrical dangers even at voltages in excess of any that you will ever supply to your PC.

UL engineers even verify the printed ratings of the device—both those on the equipment and those in the manual—to be certain that these properly reflect the type of power source into which the device can be plugged and the amount of current it draws. They ensure that the information provided is adequate—at least about the electrical nature of the device—for you to use the equipment properly.

FOLLOW-ON PROCEDURE

As indicated earlier, Underwriters Laboratories' program does not end with testing the single unit a company submits for evaluation. After all, an unscrupulous manufacturer might be tempted to build a super-

rugged prototype, send it in for evaluation, then build the units he sells from the cheapest, flimsiest parts available. To keep the UL mark on their equipment, then, manufacturers must agree to make certain follow-up tests on *all* the products that come down its assembly line.

The manufacturer's own follow-up tests include a production-line dielectric voltage test and an earthing (grounding) continuity test. For the former, a voltage is applied between the two electrical contacts of the unit's plug (the flat blades) and the ground connection (the round pin). Passing this test assures that nothing in the manufacturing process damages any wiring in the unit that could cause a short circuit and lead to shock potential from touching the unit's case. The earthing continuity test assures that the ground pin on the power cord is actually connected to all user-accessible parts of the case, ensuring that the case of every unit produced is properly grounded.

Additionally, under terms of the contract with Underwriters Laboratories, the manufacturer opens his production facilities to random UL spot checks four times a year. Without notice, a UL engineer may

ask to see the equipment being made and test units off the assembly line.

SEPARATING THE SYSTEMS

A UL listing often sets the computers made by major manufacturers—the so-called first and second tiers of the industry—apart from the low-margin, low-cost makers who moved but recently from garages into industrial parks. Computers from larger manufacturers like Compaq and IBM all wear UL listings. Many mail-order systems do not.

One reason for this separation is that old-line manufacturers know that the major businesses who are their principal customers often require the assurance of a UL listing on the products they buy. Another reason is that many small companies may not know what is involved in UL approval (part of the purpose of this article) and how to achieve it. Perhaps the most compelling reason you don't see the UL label on the lowest-priced PCs, however, is that getting a listing can be expensive.

The computer maker must bear the entire cost of the UL approval process. Essentially, that means contracting with Underwriters Laboratories for their safety



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engineering expertise.

Underwriters Laboratories must charge for the time it takes its engineers to disassemble the computer to see how it is made and how its construction affects its safety. Part of the cost of running the entire Underwriters Laboratories' worldwide operation must be factored into the rates charged for testing each computer system. The expense of the follow-up testing and inspections must also be added to the cost. In other words, getting a listing is not cheap.

The exact charge imposed by UL for sending a product through the listing process varies with the product and—like any contract—is subject to negotiation. According to UL publications, identical charge schedules apply to all investigations. Some products, however, may require more UL involvement and consulting work. One peripheral manufacturer reported that his average cost for submitting a product for UL evaluation ran between \$3,000 and \$5,000.

And sometimes that's just the begin-

ning. These charges assume a product that's completely safe, from an engineering standpoint. After inspecting and testing the product, Underwriters Laboratories may make suggestions about improving the product's safety—suggestions by which the manufacturer must abide in order to gain a listing. Every improvement adds to the development cost of the product.

Moreover, the equipment submitted by the manufacturer is evaluated by a testing process that may well be destructive. For example, hand-held devices must undergo drop tests from 1 meter high onto a hardwood floor. After the test, the product must remain safe—but it need not remain operable. Other tests involve simulating faults, as well as heating and even applying flames to the equipment. Even if an evaluation sample comes back in a single piece after testing, it may no longer be salable. One manufacturer of UL-listed peripherals reports that he routinely writes off the cost of the evaluation sample as part of the UL approval process. For a small company making 486-based PCs, that's hardly a trivial expense.

According to companies contacted by *PC Magazine*, the total cost of achieving a

UL listing for a complete computer system starts at about \$10,000 and can spiral upward if the original design is particularly poor, from the standpoint of product safety. Some small-system vendors may have invested less capital than that in the entire design of their products. UL's charges could wipe out the profits from weeks of production in today's highly competitive low-end of the PC market.

For many manufacturers, the cost of a UL listing is not a consideration. It's as much a necessity as a microprocessor in a PC. The UL label broadens the market for the product. And while it doesn't assure against product liability lawsuits, a UL listing is evidence that the product design meets recognized safety standards.

Whether you should buy a product lacking a UL listing is a personal decision. Certainly such equipment *can* be just as safe as listed devices. But the UL logo gives you the assurance that the product displaying it has been independently tested for safety. It's one of the few forms of peace of mind you can buy. ■

Winn L. Rosch is a contributing editor of *PC Magazine*.



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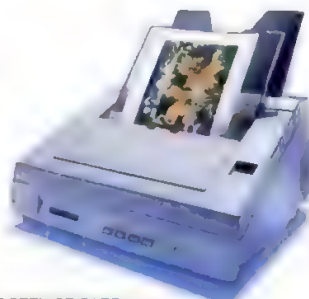
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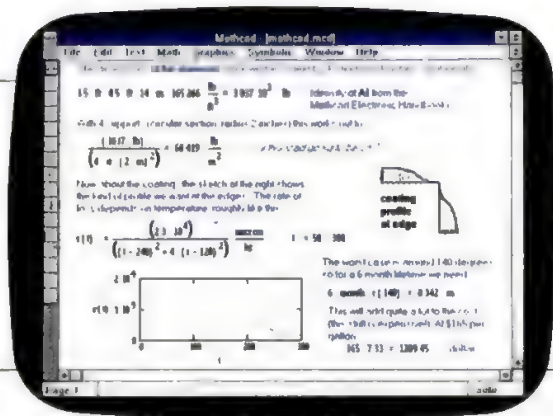
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Utilities

If you're a new *Windows* user, you probably run the Control Panel color program almost as often as you play Solitaire. Everyone loves to create his own new color sets—and usually changes them more often even than wallpaper patterns.

Customizing colors through the Control Panel facility has two limitations, however. For one thing, the Control Panel shows your color changes in a kind of pseudo-window that often doesn't adequately reflect how they will look after you exit and see them in real windows. Try changing the color of the window frame from the default black to blue, for example. The appearance is positively electric in the Control Panel's simulated window, but when you get back to the desktop the effect is unacceptably weak and watery.

Second, while the Control Panel lets you set the colors of 13 different *Windows* components, there are actually six additional color-controllable elements to which the Control Panel provides no access: the color of highlighted menu items and their text, the text of grayed (unselectable) menu items, and the faces, text, and shadowed borders of the push buttons. (*Windows* doesn't let you change the color of system icons, scroll bar arrows, or the minimize/maximize buttons.)

WINCOLOR is the answer to both these Control Panel limitations. It lets you change *all* the *Windows* component colors you can change and view the impact of your modifications as you make them.

The easiest way to get a copy of WINCOLOR.EXE is to download it from PC MagNet, as explained in the PC MagNet News page following this article. The C source code is also available from PC MagNet. Recompiling will require either Borland C++ 2.0 or a Microsoft 6.0a (or later) C compiler. If you don't have a modem, you can get a copy of the source code by mail or fax. Simply send a postcard with your name and address (or fax number if applicable) to the attention of Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; no phone calls, please.

WINCOLOR.EXE: Maximum Color Control in Windows

■ WINCOLOR.EXE lets you properly display and set custom colors for more *Windows* components than you can through the Control Panel.

USING WINCOLOR

Installing WINCOLOR is straightforward. You just copy it to your hard disk and load it via the File Run command, or you can create a new program item with the Program Manager. Alternatively, you can start both *Windows* and WINCOLOR from the DOS prompt by entering

WIN WINCOLOR

Once *Windows* is running and WINCOLOR is loaded, you'll see the display shown in Figure 1.

The Work Area, initially white, is used for the color you are presently mixing or using. This color can be modified at any time by adjusting the Red, Green, and Blue sliders, each of which increases the value of its respective color from 000 (off) to 255 (full on). When all three colors are at maximum, the result is white.

The two Selected Color boxes show the dithered and the pure forms of the currently selected color. For reasons known only to Microsoft, the ten *Windows* components labeled in red in Figure 1 use only pure colors (which appear in the right-hand Selected Color box). The other nine elements use dithered shades as well. The 36 initially white Custom Color squares are

like their counterparts in the Control Panel color facility: Use them as a palette on which to store any colors you wish.

The four groups (Window, Menu, Miscellaneous, and Button) of labeled rectangles each contain the current color of a *Windows* element. Thus, the first rectangle in the Window section shows the color of window text and the rectangle below it contains the window frame color. Note that the items in the Miscellaneous group refer to components used throughout *Windows*: Grayed Text is for the listing of disabled (unselectable) items; the desktop background is the color of the desktop if you don't have a bitmap loaded. The application workspace is the color of the surface on which child windows reside in a Multiple Document Interface (MDI) application such as the Program Manager.

Changing the color of a *Windows* component could hardly be easier. You *select* a color from any visible box—from the Work Area, one of the Custom Color rectangles, or a *Windows* component rectangle—by clicking on it with the left mouse button. The Selected Color boxes change to reflect your current choice. You *paint* the selected color, again onto any box, by right-clicking on it with the mouse. That's all there is to it—assuming, of course, that you haven't swapped your mouse buttons!

To paint a color into the Work Area there's even a shortcut to the left-click, move, right-click procedure: just left-double-click on the desired color. As you modify the colors in the Work Area with the horizontal scroll bars, the Selected Color squares will track changes. When you see the color you want, simply right-click on the labeled box for the component that

Utilities

you want to have that color.

To see what a color combination looks like overall, press the Set button. Set changes the color of all *Windows* components to reflect those displayed in WINCOLOR's component rectangles. Even WINCOLOR's colors will change.

If, in the future, you want to use the colors you've chosen, press Save. Save updates the color settings in WINCOLOR's private profile, WINCOLOR.INI. (This file is created in your *Windows* directory when you install WINCOLOR.) If you don't like the decor you've selected, press the Restore button. This resets your *Windows* colors to those in effect when WINCOLOR first came up (if you haven't previously saved any changes) or to those you last saved in WINCOLOR.INI. Note: Pressing Save will *not* make any color changes permanent in the *Windows* interface. To do that, you must check off the Update WIN.INI option on the system menu. Without checking this option, the color settings are not written to WIN.INI.

If you navigate *Windows* using the keyboard, pressing Tab will move you to the different areas on the screen; Shift-Tab will reverse direction. Press Alt-S to select a colon and Alt-P to paint a colon. And, once you've Tabbed to the Scroll Bars, use the Arrow keys to scroll. A summary of WINCOLOR's commands and operations can be invoked via the Help button.

SYSTEM MENU OPTIONS

Following the example of WINSAVER (Utilities, May 14, 1991), WINCOLOR puts several selectable options in its System Menu box. These are AutoSave, AutoLoad, AutoPilot, and Update WIN.INI.

When you close WINCOLOR, it will prompt you to save any unsaved changes you have made via the Set command. You can turn off this prompt and automatically save such changes by checking (selecting) the AutoSave option. (If you opt not to save the settings changed via Set, WINCOLOR will revert to the *Windows* colors active when you first ran WINCOLOR or to those established by your last Save.)

The AutoLoad option lets you automatically install (or uninstall) WINCOLOR in the LOAD= statement of the [windows]

section of your WIN.INI file. If AutoLoad is checked, each time you start up *Windows*, WINCOLOR will automatically run and restore the component colors you last saved. Thus, you won't have to start WINCOLOR manually.

Check the AutoPilot option when you want to keep a color set for a while. AutoPilot causes WINCOLOR to run invisibly, set your system colors, and exit. You won't see the menu or any activity of WINCOLOR, just a change in the *Windows* component colors.

If you check AutoLoad and AutoPilot, WINCOLOR will set the system colors invisibly when you start *Windows*. This is the best way to use WINCOLOR once you've found the colors you like.

Note that if AutoPilot is on, you can't use WINCOLOR interactively: It will simply start, change the system colors, and exit. To bring up WINCOLOR's window when AutoPilot is on, start it with any command line argument. For example,

WINCOLOR /oo

will always bring up WINCOLOR when entered on the Program Manager's File



Eeeek!

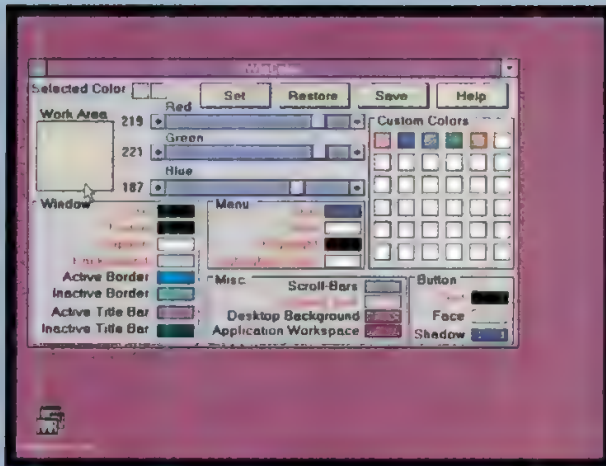
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Figure 1: You can mix any desired color in the Work Area and then paint it into any of the labeled Windows elements with the click of a mouse.



Run command line or if put in the Properties field of a Program Manager program item. If WINCOLOR finds any argument on its command line, it overrides the AutoPilot and runs interactively.

As already noted, WINCOLOR lets you keep the [colors] section of WIN.INI

updated. If you select Update WIN.INI and change the system colors with WINCOLOR, Windows will automatically use those colors when you start it. Unfortunately, even the updated WIN.INI will not include those color components that are not addressed by the Control Panel's color

facility, so you still have to run WINCOLOR if you change the color of push buttons and the like. But Update WIN.INI does let Windows know about the changes to 13 of the 19 color-changeable components. And when you use it along with AutoLoad and AutoPilot, color changes made while loading Windows will seem the least abrupt.

Finally, the About item brings up the usual Windows application About Box.

HOW WINCOLOR WORKS

With the Windows API SetSysColor and GetSysColor functions, you can set and retrieve the color of any Windows component. Both functions use a 32-bit double word (an unsigned long integer) to store the color value. Three of the four 8-bit bytes in the double word are used for the red, green, and blue components of the color, respectively. Windows supplies a macro, appropriately called RGB(), that combines these three components into a double word for storing or retrieving color values.

To track the color values of the rectangles in WINCOLOR's interface, the program uses the following structure:

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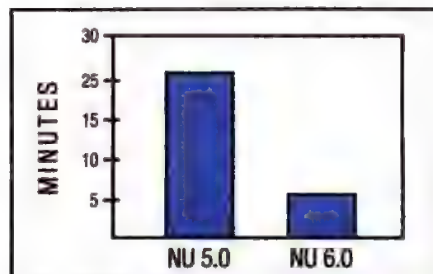
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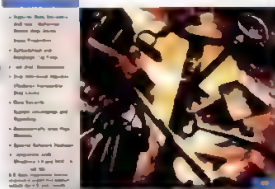
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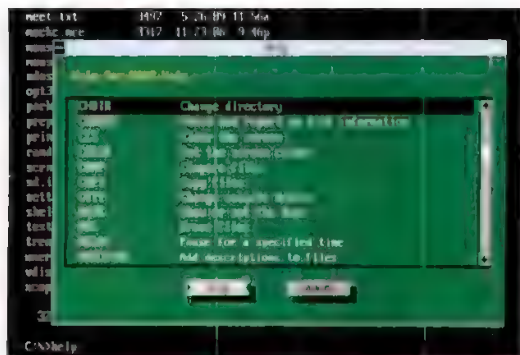
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Need to find the latest files? The Software and Utility Library (GO SOFT-LIB) provides three catalogs, complete with filenames, locations, and brief descriptions of each listing. PCMCAT.ZIP—a complete list of all *PC Magazine* utilities and related files.

SHWCAT.ZIP—a catalog of the

high-quality freeware and shareware, including those mentioned in earlier issues. Some valuable tools include: PKZIP (PKZ110.EXE) and ARCE (ARCE.EXE) for archiving and extracting files, VDE text editor (VDE.ZIP), *AsEasyAs* spreadsheet (AS-EASY.ZIP), and *Windows* icons (MGICON.ZIP). All catalogs can easily be printed with two *PC Magazine* HP LaserJet utilities: PCBOOK lets you create your own booklet, and LASERLST lets you print two pages on one piece of paper. If you prefer not to use paper at all, browse the catalogs with BROWSE.COM or WINSMOOTH (WSMOOT.ZIP).

A downloadable index to *PC Magazine*'s product reviews is also available. PCM.EXE is a self-extracting file containing the *PC Magazine Reviews Index* for January 1988 to December 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files. ■

```
typedef struct _colorrect
{
    RECT    r;
    DWORD   color;
    BOOL    solidonly;
} CRECT;
```

This structure contains the coordinates of each rectangle in the WINCOLOR interface, the color of the rectangle, and a flag that signifies whether the rectangle represents a component that allows only solid colors. WINCOLOR uses a table of such structures to store the values for the Selected Color rectangles, the Work Area, the component colors, and the Custom Colors. A similar table is used to store the *Windows* component colors saved from the previous WINCOLOR session.

WINCOLOR contains both a rectangle's color and its interface screen coordinates, so it can use the same table both to select the color in a box and to paint the box with a new color. For instance, when the user left-clicks a rectangle to select its color, WINCOLOR receives a WM_

LBUTTONDOWN message from *Windows*. The lParam parameter of WM_LBUTTONDOWN holds the coordinates of the interface location at which the user clicked. With those coordinates, WINCOLOR's SelectColor function looks at each rectangle in the table and calls the *Windows* PtInRect function to see whether the coordinates fall inside one of the rectangles. If they do, SelectColor calls its _PaintRect function to retrieve the color value of that rectangle, store it in place of the color value of the Selected Color rectangles, and paint them with that color.

If the user right-clicks to paint a box with the selected color, WINCOLOR again uses the lParam parameter, this time accompanying a WM_RBUTTONDOWN message. The _PaintRect function is called to find the rectangle with those coordinates. If one is found, it is then painted with the selected color. The box's color value in the table is then updated with that stored in the Selected Color entry.

If the user left-double-clicks a rectangle, WINCOLOR passes the lParam pa-

rameter to its PaintWorkArea function. This function also looks in the table for a rectangle with the coordinates stored in lParam. If one is found, PaintWorkArea uses that rectangle's color values to paint the Work Area. When it receives scroll-bar messages, WINCOLOR calls its _PaintCombo function to paint both the Selected Color rectangles and the Work Area with the selected color.

The table of CRECT structures is used in updating WINCOLOR's private profile, WINCOLOR.INI. WINCOLOR simply swings through each item in the table and writes an entry for each to WINCOLOR.INI. In this section of the code, I didn't use WritePrivateProfileString, for writing a private profile. That function has to find the file, open it, write the line and close the file with every call, so it's very slow. Even on a 33-MHz 386 machine, it took 15 seconds to write WINCOLOR.INI using this function.

Instead, therefore, I used the *Windows* OpenFile function and the low-level C file I/O function write. In the source code,

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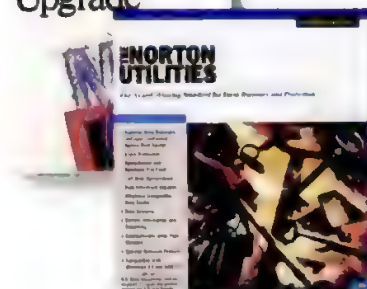
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Utilities

you'll find it used in the WINCOLOR SaveColorsToIni function. Using SaveColorsToIni to do the writing rather than WritePrivateProfileString reduced the time required to save WINCOLOR.INI to 3 or 4 seconds.

If you have checked the Update WIN.INI option in the System Menu, WINCOLOR uses its UpdateWinIni function. This does call the *Windows* API function WriteProfileString; I found this much easier (and faster) than having to parse WIN.INI, find the [colors] section, and rewrite that part of the file. Note that UpdateWinIni uses a table, WinIniKeys, to find each color line used by the Control Panel.

UNUSUAL BEGINNINGS

Because of its interface design, creating a resizable window for WINCOLOR was unnecessary: There isn't any additional part of the window to be displayed. For the same reason, WINCOLOR cannot be maximized, though it *can* be minimized to an icon. So, rather than creating an ordi-

nary window, I put WINCOLOR's entire interface in a modeless dialog box—that is, a dialog box that can exist even in the absence of a main application window.

Creating a modeless dialog box is slightly different (though no more painful) than creating a standard window. The main differences are in registering the window class and calling CreateWindow. When you register the class for a modeless dialog box, you must set the cbWndExtra member of the WNDCLASS structure to DLGWINDOWEXTRA. Further, the hbrBackground member should be set to COLOR_WINDOW+1 in order to use *Windows*' systemwide window color. Finally, instead of calling CreateWindow, WINCOLOR calls CreateDialog thus:

```
WinColorDlg =  
CreateDialog(hInstance,  
szWinColor, 0, NULL);
```

You can use the handle returned from CreateDialog as you would the window handle returned by CreateWindow. The szWinColor variable contains the name of a dialog template, which you can create with any one of a number of dialog editors

(one is provided in the *Microsoft Windows* SDK). Personally, I prefer using the dialog editor in the Whitewater Group's Resource Toolkit, which comes with Borland C++ (which I used to complete the original program). Since Borland C++ compiles *Windows* applications in either C or C++, it didn't matter that WINCOLOR itself was written in C.

WINCOLOR doesn't even create the dialog box if its AutoPilot mode is on. Early in WinMain, WINCOLOR calls its InitArray function, which initializes part of the rectangle table and calls its GetColorsFromIni function to read WINCOLOR.INI. After returning, if WINCOLOR finds that AutoPilot is set, it checks the command line for arguments. If no arguments are found, WINCOLOR calls SetColors from WinColors to set *Windows*' component colors, and then exits.

Future versions of *Windows* may include utilities that let you take full advantage of the capabilities built-in to *Windows*. But for now, WINCOLOR is another tool that helps you tap the full power of *Windows*. ■

Richard Hale Shaw is a contributing editor of PC Magazine.

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Ken currently works for the Mississippi Department of Human Services as a Systems Analyst. Prior to this he spent six years doing consulting and contract programming with an emphasis on PC work. He is married, although his wife has some questions as to whether it is to her or to the PC.

So give Ken a visit over in UtilForum (GO UTILFORUM), he'll be sure to welcome you kindly.—Chris Parker

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CIRCLE 497 ON READER SERVICE CARD

by
Charles Petzold

Environments

Two significant features were added to the Graphics Device Interface (GDI) in *Microsoft Windows 3.0*: the palette manager and the device-independent bitmap (DIB). Although I've discussed them separately over the past several months, DIBs and palettes must be treated together. An important use of bitmaps is the storage and rendering of real-world images; the palette manager helps by allowing you to choose the colors best suited to these images.

In this column and the next, I'll discuss how to use device-independent bitmaps and the *Windows 3.0* palette manager together to display bitmapped images with accurate colors. I'll begin in this column discussing gray-shaded images. I'll attack color in the next issue.

SHADES OF GRAY

We tend to use the term "black-and-white" to refer to noncolor photographs or movies. But black-and-white is really a misnomer, because such images contain various shades of gray between the black and white extremes. Perhaps *nonchromatic* would be a better term. In TV video technology, it is said that such images have a *luminance* (light intensity) but no *chrominance* (color). I'll generally use the term "gray-shaded" as a compromise between the oversimplistic term and the technical jargon.

If you think about it, gray-shaded images should appear grossly unnatural to us. In our day-to-day life we put a lot of emphasis on color. We determine peoples' health or whether they've been on a sunny vacation by the color of their skin. We judge the freshness and edibility of food by its color. A tiny difference in color impels us to buy one article of clothing rather than another. Marketing research in product packaging is very much concerned with color. In the book-publishing industry, for example, one common rule is that books with green covers do not sell well.

So it seems odd that we can drain all the color from an image and still accept it as an accurate portrayal of the real world.

Displaying Bitmap Images In Shades of Gray

- Three approaches to defining a custom palette for the display of device-independent bitmaps.

Gray-shaded images show only light intensity, which is only a *part* of human visual perception. Yet for many many decades after the invention of photography, gray-shaded images were accepted without a problem. Even today, many of the photographs reproduced in newspapers are gray-shaded. Black-and-white photography has never died and often achieves a vivid representation of the real world. I don't think anyone has ever suggested that Ansel Adams's landscapes could be improved with color.

Similarly, despite the travesty of "colorization," many of the best films in the history of motion pictures have been black-and-white, and we value their images of the world. To some degree, it's the use of shadows and the contrast between dark and light that give classic American film noir and horror films their unique vision.

Gray-shaded images can be sharper and more distinct than color images because rendering gray images demands less tech-

nical precision. Color, as we've learned, requires three components—either the additive primaries of the video monitor or the subtractive primaries used in printing. These three components must be precisely coordinated for a sharp color image. But they can't be. Look at your video display with a magnifying glass; the red, green, and blue components of each pixel do not form a single dot. They are three separate dots, and this makes the image a little fuzzy. A monochrome monitor uses a single dot per pixel, for a sharper image.

Perhaps the acceptance of gray-shaded images is related to Marshall McLuhan's theories of media. A gray-shaded image requires the viewer to fill in the color (subconsciously, of course), and this offers

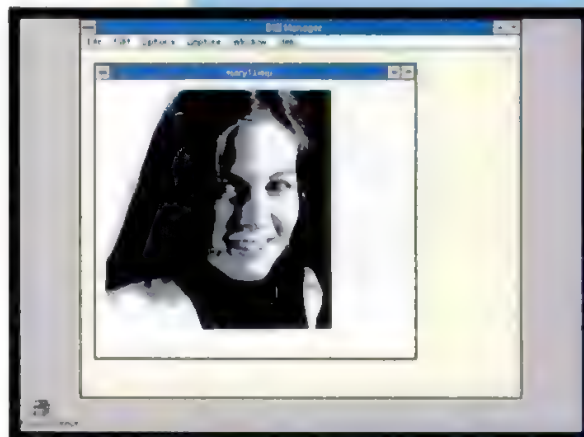


Figure 1: A 256-gray-shade bitmap displayed on an IBM 8514/A under *Windows 3.0* using the default palette.

Environments

the mind an opportunity to psychologically participate with the images in a more satisfying manner. I've encountered people who have sworn to me that Alfred Hitchcock's *Psycho* and George Romero's *Night of the Living Dead* were filmed in color. Obviously the color was filled in by their minds when they viewed the often startling black-and-white images in these films.

I've read that many people dream in black and white at least some of the time, and that some people *always* dream in black and white. Perhaps this is also a key to our acceptance of the gray-shaded image. Even before the invention of printing and photography, humans saw gray-shaded images in their minds in the night. Perhaps gray-shaded images in photography and film touch us so deeply because they seem like dreams to us.

GRAY SHADES AND TECHNOLOGY

When you're dealing with real-world images in the computer, the big advantage of gray shades over color is that they require much less in the way of machine resources. (Yes, we're always glad when aesthetic satisfaction and low memory requirements coincide!)

In *Windows*, as in most modern graphics systems, color is represented by a combination of 256 levels each for red, green, and blue. But the number of differ-

ent colors you get with this scheme is over 16 million (256^3). Even if we acknowledge that today's video adapters and displays are limited to roughly a 6-bit resolution for each of the three primaries, this still involves 256,000 different colors. Most video adapters in common use today can not display that many colors simultaneously.

With gray shades, however, these requirements are dramatically reduced. At most, you need 256 different shades of gray (equal levels of red, green, and blue). Most video adapters, monitors, and scanners are limited to a 6-bit resolution, or 64 gray shades. When *Windows* uses a 256-color video adapter (such as the IBM 8514/A or a Super VGA adapter), it reserves 20 colors. A *Windows* program can easily request 64 gray shades using the palette manager and be assured that these colors will be available when the program is running in the foreground.

If you consider also that most printers in common use today are not capable of color (and those that are usually cost big bucks and are slow besides), gray-shaded images are still quite important.

SCANNING GRAY SHADES

I've recently been working on a *Windows* "DIB manager" program that I call DIBBLE. A beta version of this program should be available on PC MagNet by the time you read this column. I've been using DIBBLE to explore the relationship between the *Windows* palette manager and device-independent bitmaps. Getting a real-world image into the computer requires a scanner or a video frame grabber. I have a Sharp JX-100 color scanner, and I've recently added code to DIBBLE

to scan in an image and convert it to the packed-DIB memory format that I discussed in the last issue. Color scanners are usually quite expensive, but you can pick up a JX-100 for

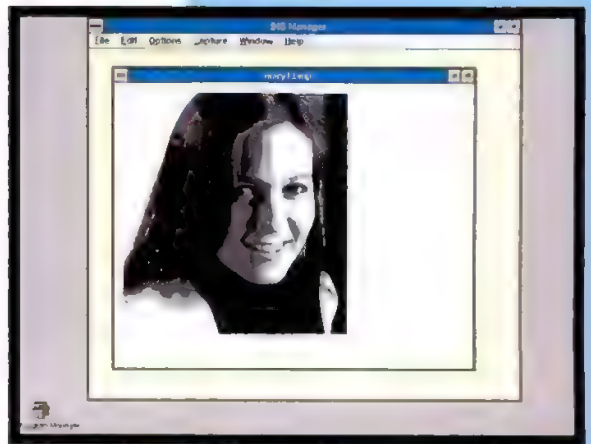


Figure 3: A 256-gray-shade bitmap displayed on an 8514/A under *Windows* 3.0 using four gray shades.

under \$1,000. It has a maximum resolution of 200 dots per inch and 8 bits per pixel per primary color (although only the high 6 bits are meaningful). The JX-100 also has a gray-shade mode with 8 bits per pixel. The main disadvantage of this scanner is that the scanning area is limited to about 4 by 6 inches. The JX-100 interfaces through the serial port, which means you can avoid the messy problems of accessing hardware under protected-mode *Windows*, but scanning time can be very slow, at 9,600 bits per second (or 19,200 if you're brave enough to push *Windows* to its limit).

I used a 2-inch-square black-and-white photograph of *PC Magazine* associate editor Mary Kathleen Flynn as a sample gray-shaded image, the same one the magazine uses to test printers' capability to render gray-shade graphics. I used DIBBLE and the JX-100 in its 8-bit gray-shade mode to scan this image at 200 dots per inch. The scanned bitmap image is 496 pixels high by 448 pixels wide with 8 bits per pixel.

As I discussed in the last issue, preserving a device-independent image in a *Windows* program requires that you avoid using GDI for storing the image. If you create a GDI bitmap object, the image is converted into a device-specific format, and that process usually will not preserve the colors of the image.

For this reason, DIBBLE allocates a global memory block to store the scanned data in the packed-DIB memory format. This is basically a `BITMAPINFOHEADER` structure, followed by an array of `RGBQUAD` structures for the color table,

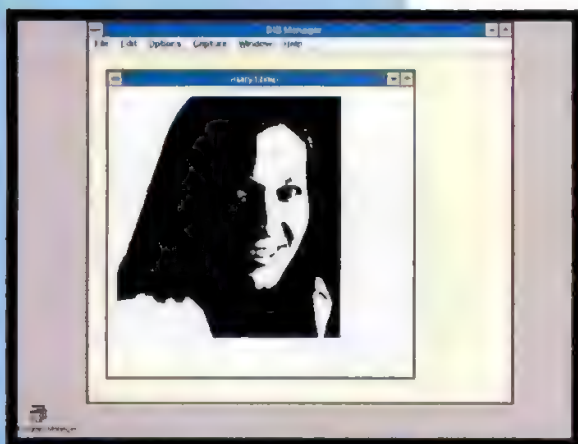
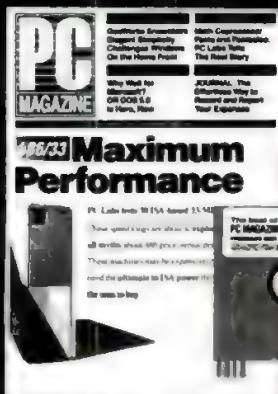


Figure 2: A 256-gray-shade bitmap displayed on an 8514/A under *Windows* 3.0 using two gray shades (black and white).

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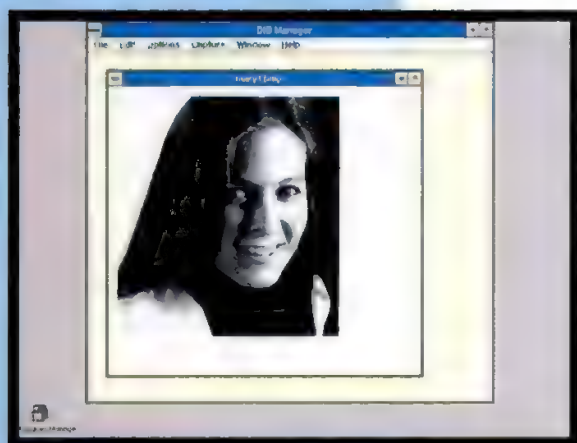


Figure 4: A 256-gray-shade bitmap displayed on an 8514/A under Windows 3.0 using eight gray shades.

followed by the bitmap bits. For this particular bitmap, I set up the RGB color table with all 256 gray shades: the RGB values 00-00-00, 01-01-01, 02-02-02, and so forth up to FF-FF-FF. Each pixel in the bitmap is 1 byte and is simply an offset into the color table. Thus, the pixel value is simply the 1-byte gray-shade value.

Once a packed-DIB memory block is created, the image can be displayed by passing offsets into the memory block to the SetDIBitsToDevice function. Figure 1 shows the results of doing this on the 8514/A with no palette manipulation.

The default palette for the 8514/A consists of 20 colors. When displaying this bitmap, the 8514/A device driver must match each of the gray shades in the bitmap to one of the 20 colors using a "nearest-color" algorithm. The displayed bitmap contains six different colors. Obviously it contains 00-00-00 (black) and FF-FF-FF (white) and the two light and dark grays (80-80-80 and C0-C0-C0). But the 8514/A driver also uses two of the oddball colors in the default palette: C0-DC-C0 and FF-FB-F0. These are not exactly gray shades (in fact, they look a little yellow-greenish), but they are close enough to gray to fool the nearest-color algorithm.

DEFINING A GRAY-SHADE PALETTE

The image shown in Figure 1 is certainly recognizable, but let's see if we can find a way to improve it.

One easy way to improve the image is

to create a palette using the CreatePalette function. The simplest approach is to use a number of uniformly spaced gray shades represented as RGB (red-green-blue) color values. You select this palette into the device context (SelectPalette) and realize it (RealizePalette). If you then display the image using SetDIBitsToDevice, the device driver will use the custom palette colors.

It's interesting to proceed methodically with defining progressively larger custom palettes. I'll begin with a palette containing just two gray shades—the RGB colors 00-00-00 (black) and FF-FF-FF (white). After creating, selecting, and realizing that palette, SetDIBitsToDevice displays the image shown in Figure 2.

Obviously, this is not much of an improvement! As you can see, the device driver now uses only the two colors in the custom palette to display the image. The darker gray shades are mapped to black and the lighter gray shades are mapped to white.

The image in Figure 2 really took me by surprise. I had assumed that the device driver would use both the colors in the default palette and the colors in the custom palette. However Figure 2 provides an instructive lesson: When you realize a custom palette before displaying a bitmap with SetDIBitsToDevice, only the colors in the custom palette will be used for the image.

Now we'll create a custom palette containing four entries—RGB values with equal red, green, and blue levels of 00, 55, AA, and FF. The result of this is shown in Figure 3, which is similar to Figure 1. Both use mostly black and white and two medium shades of gray.

The next step, of course, is eight gray shades. The custom palette contains RGB values with equal red, green, and blue values of 00, 24, 48, 6D, 91, B6, DA, and FF. The bitmap displayed with this palette is shown in Figure 4. This is my least

favorite rendition of the image. It's as if the eight gray shades are trying hard to approximate the image but failing miserably. Look at the rippled contours on the forehead where the nearest-color algorithm is obviously working but certainly not with any aesthetic judgment.

Moving to 16 gray shades improves the quality of the picture dramatically. The 16 shades use equal red, green, and blue values of 00, 11, 22, and so forth, up to DD, EE, and FF. The results are shown in Figure 5.

The image in Figure 5 has clearly crossed the acceptability barrier. In fact it looks so good that I had to spend some time convincing myself that it is composed of only 16 gray shades. (The WHATCLR program I discussed in the April 30, 1991, issue came in handy for this job.)

Although Figure 5 looks good, on close examination it still reveals some disturbing contours in the shadowed area of the cheek and chin. Stepping up to 32 gray shades (Figure 6) just about eliminates them.

For the sake of completeness, Figure 7 shows the image using a custom palette of 64 uniformly spaced gray shades.

At this point, the improvements are marginal, if evident at all. Going beyond 64 gray shades doesn't help, because the 8514/A adapter is limited to a 6-bit color resolution.

So here we have one approach to displaying gray-shaded device-independent bitmap data under Windows 3.0: You simply choose the number of gray shades you want to use (usually 16, 32, or 64, depending on how much of the system palette

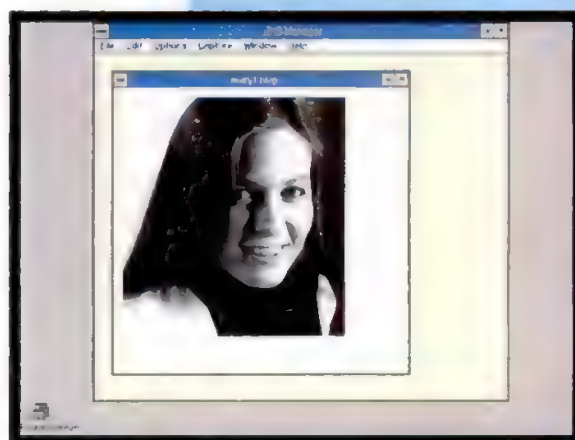


Figure 5: A 256-gray-shade bitmap displayed on an 8514/A under Windows 3.0 using 16 gray shades.

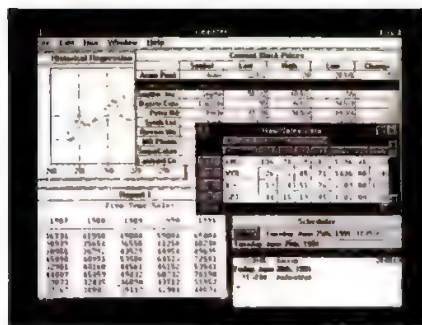
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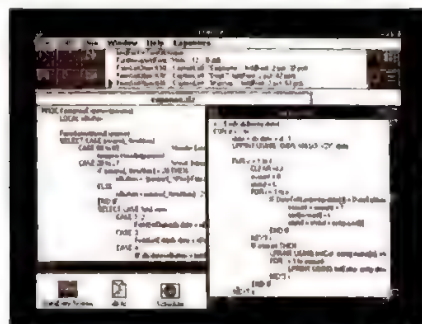
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you want to hog), calculate uniformly spaced gray values from 00 to FF, create the palette, select and realize it, and display the image using the SetDIBitsToDevice function.

There are a couple of problems with this particular approach, however. First, your program has to know that the bitmap is really composed solely of gray shades. (Or else you have to rely on the user to inform the program of this fact through a menu selection, which is one of the DIBBLE options.)

Second, suppose that the image is gray-shaded but most of the grays are concentrated in one part of the total spectrum. You might be defining palette entries that the bitmap doesn't use.

USING THE BITMAP COLOR TABLE

A second approach to defining a custom palette for a device-independent bitmap is to use the bitmap's color table. As you will recall, a device-independent bitmap has a color format with 1, 4, 8, or 24 bits per pixel. These correspond to 2-color, 16-color, 256-color, or 16 million-color images. Except for the 24-bit DIB, the bitmap contains a color table that is either an array of RGBQUAD or RGBTRIPLE structures, usually with 2, 16, or 256 entries. For 4-bit and 8-bit bitmaps, the color table may be smaller than 16 or 256 entries. This would be indicated by the biClrUsed field in the BITMAPINFO-

HEADER structure.

The color table allows you to define a palette that corresponds exactly to the colors in the bitmap. You set up a LOGPALETTE structure with one palette entry for each color in the bitmap. You then transfer the RGBQUAD color values from the bitmap color table into the PALETTEENTRY array. (A warning: Don't try to be as clever as I thought I was when I cast an RGBQUAD structure into a PALETTEENTRY structure. These two structures look similar but have opposite ordering of the red, green, and blue byte values!)

Using the bitmap color table for the palette avoids the problem of your program knowing whether it's dealing with a gray-shade or color bitmap. As long as the video display supports palette manipulation and the bitmap contains a color table (which is always the case except for 24-bit bitmaps), you can base the palette on the actual bitmap colors.

Still, there's one little problem: With a video board that supports 256 simultaneous colors, Windows reserves 20 colors. If the bitmap (and therefore the custom palette) contains 256 color-table entries, Windows can't use all of them. It's possible that the 20 colors at the end of the bitmap color table will be completely ignored. Obviously, then, the most important colors in the DIB color table should appear at the beginning. This helps ensure that the image is displayed as accurately as possible.

The optimal ordering of the color table probably should be performed right after the bitmap image is defined. For example, in a scanning routine, the color table can be reordered after the scan has completed. For each of the colors in the color table, you need to accumulate a count of the number of pixels of that color. You then sort by the pixel count. This becomes the new color table. You must then convert all the pixel values from the old indexes to the new indexes.

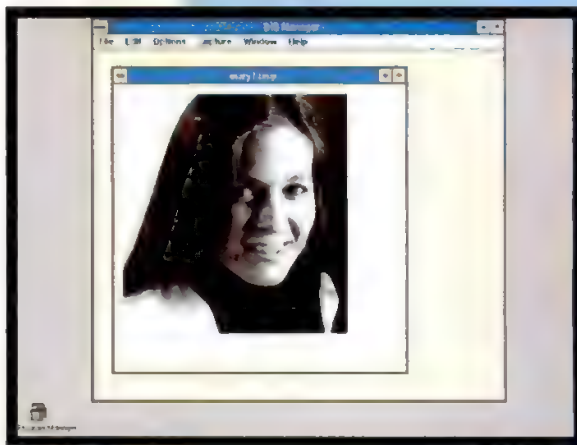


Figure 7: A 256-gray-shade bitmap displayed on an 8514/A under Windows 3.0 using 64 gray shades.

A THIRD APPROACH, FOR SPEED

We've now seen two approaches to defining a custom palette for the display of a device-independent bitmap. You can create this palette based either on colors your program selects or on the bitmap color table. In either case, however, the SetDIBitsToDevice function must perform a nearest-color search when displaying the bitmap.

You can speed up the bitmap display by replacing the bitmap color table with palette indexes. This is rather simple (at least in theory): You first use the bitmap color table to create a palette (just as in the second approach). You then replace the color table in the bitmap with an array of 16-bit integers corresponding to the palette indexes. In the normal case, these integers will increase sequentially from 0 to the number of colors in the bitmap—less 1. (Don't make the same mistake I did in thinking that each of these palette indexes occupies the same memory locations in the bitmap color table as the corresponding RGB value. Instead, the color-table memory must be treated as an array of 16-bit integers.)

Once you do this, you can select and realize the palette and then call the SetDIBitsToDevice function using the constant DIB_PAL_COLORS rather than DIB_RGB_COLORS as the last parameter to the function.

Now, when you display the bitmap, each pixel in the bitmap is treated as an index into the array of palette indexes in the bitmap color table. Each palette index corresponds to an RGB value in the program's palette and also corresponds

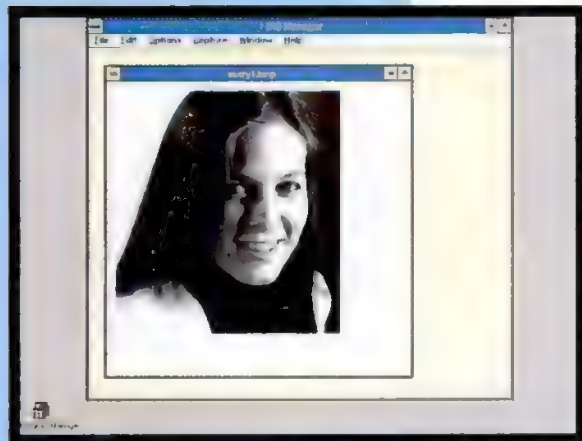


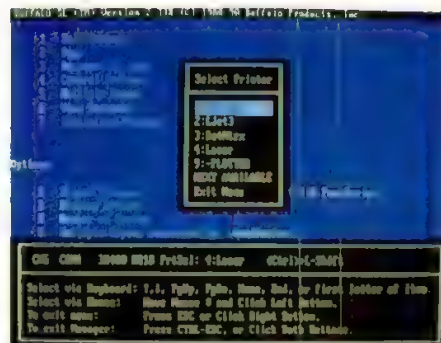
Figure 6: A 256-gray-shade bitmap displayed on an 8514/A under Windows 3.0 using 32 gray shades.

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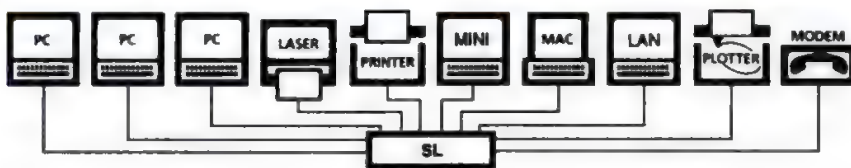
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CIRCLE 328 ON READER SERVICE CARD

Environments

to an entry in the system palette. Each entry in the system palette corresponds to an RGB value loaded into the video board. The system palette is ordered to correspond to the way pixels are stored in video memory. This sounds complicated, but despite several levels of mapping, it provides a relatively quick way for *Windows* to convert a device-independent pixel to a device-specific pixel. No nearest-color search is required.

THE BIG PICTURE

This explanation of `SetDIBitsToDevice` also applies to `StretchDIBits`, `CreateDIBitmap` (for an initialized bitmap), and `SetDIBits`. Each of these can accept `DIB_RGB_COLORS` or `DIB_PALETTE_COLORS` as the last parameter to indicate whether the bitmap pixel values are indexes into the bitmap color table or indexes into an array of palette indexes.

All four of these functions must convert an array of device-independent pixels into device-specific pixels. `SetDIBitsTo-`

`Device` and `StretchDIBits` use the device-specific pixels to display on the screen or other output device. `CreateDIBitmap` and `SetDIBits` store the device-specific pixels in memory in a GDI bitmap object.

The key problem here is the color conversion between device-independent pixels and device-specific pixels. If no palette is selected in the device context, then these four functions find the device-independent RGB color value of each pixel and perform a nearest-color search with the default palette colors, each of which corresponds to a device-specific pixel. If a palette is selected in the device context, then the nearest-color search is performed against the RGB values in the palette. Every one of the entries in the custom palette corresponds to an entry in the system palette, which in turn corresponds to a device-specific pixel. So, if `DIB_PALETTE_COLORS` is used in the function, GDI can skip the nearest-color search. That's the performance advantage.

The last parameter of the `GetDIBits` function is also either `DIB_RGB_COLORS` or `DIB_PALETTE_COLORS`. This function fills in the color table, so the effect of the parameter is to tell the function whether

to fill the color table with RGB values or with palette indexes.

Be especially careful using `CreateDIBitmap` and `SetDIBits` when a palette has been realized in the device context. GDI will use that palette in setting the pixels of the device-specific bitmap object. If the same palette is not selected and realized when it comes time to display the bitmap, you'll get garbage.

COLOR AND 24 BITS

Although I began with a discussion of gray-shaded images, you can also display 4-bit and 8-bit color bitmaps using the techniques I've described here. But where do these 4-bit and 8-bit color bitmaps come from? Very often, they originate as full-color (24-bit) bitmaps. The color tables are optimized and reduced to 16 or 256 colors.

Dealing with color bitmaps requires that you get acquainted with GDI's 24-bit color bitmaps. These bitmaps are big, they're slow, they're clunky, and they're almost impossible to deal with, yet they offer the ultimate in color description. We'll start to wrestle with them in the next installment of this column. ■

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CIRCLE 174 ON READER SERVICE CARD

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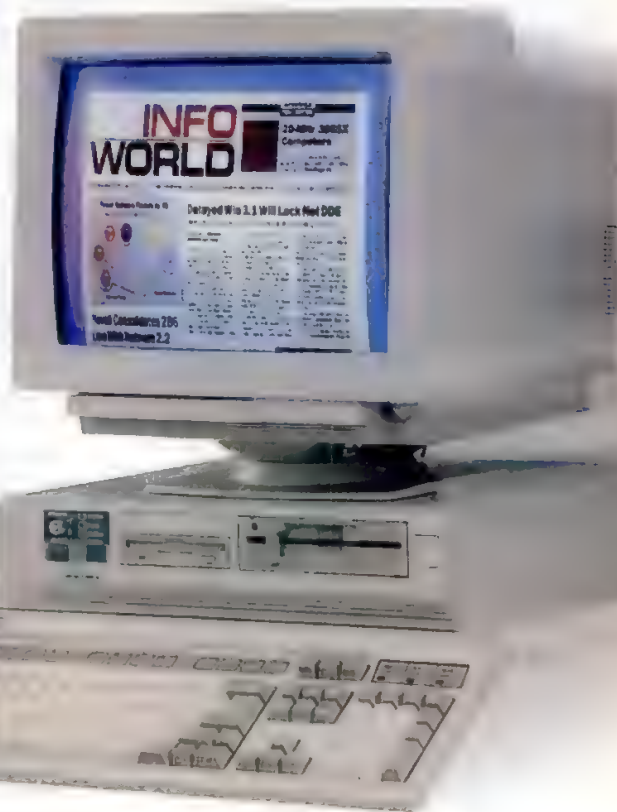
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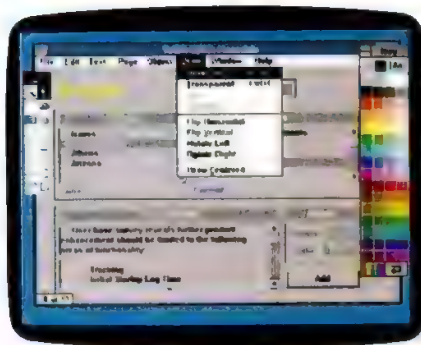
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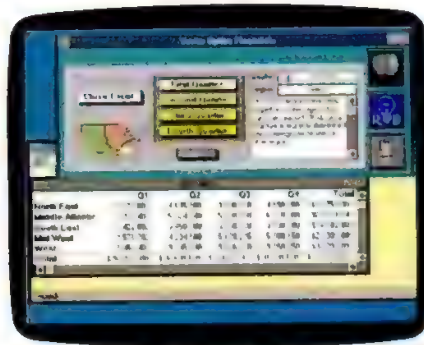
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by
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Power Programming

Operator and Function Overloading In C and C++

In a pure object-oriented programming language (OOPL) like Smalltalk or Actor, the well-defined entity that we old-timers think of as an application program really doesn't exist. That is to say, the source code for an application does not reside in any single location, so there is no way to view it as a whole or print it out. Instead, the source code is distributed across myriad definitions of *classes*, some of which are fundamental to the language and entirely designed by the language vendor, some of which are derived or "subclassed" by the application programmer from code written by the vendor, and some of which are unique to the application. All of these different classes are linked together in a treelike hierarchy whose root is a "superclass" that owns everything and does nothing.

When you peek inside a class definition, you typically find declarations of private data items and of some procedures or routines called (in OOPL-speak) *methods*. Each method is triggered by a specific *message*—a value that is magically transported from one place to another by the programming milieu. A method usually responds to a message by inspecting or changing one of the data items and often by sending a message in return. If the class definition doesn't provide a method for a particular message, the message is successively "kicked upstairs" through the network of ancestor classes until it can be processed.

But a class definition is only a template, like a `struct{ }` declaration in the C language. The class must be "instantiated" as one or more objects before it becomes a functional part of the application, just as a `struct{ }` must be instantiated as storage before it can be used. An object is an object (as opposed to a variable or procedure in a traditional programming language) because it can be addressed by a unique name and has both content and behavior. The content, or state, of the object is determined by the values of its private data items. The behavior of

■ The fundamental difference between C and C++—and the feature that makes object-oriented programming possible—is that C++ not only allows the programmer to overload functions and operators, it actively encourages doing so.

the object is determined both by the values of the private data items and by the program code that constitutes the object's methods (of course, this code actually resides in the class definition or in one of the class's ancestors and is shared by all the objects that are members of that class).

In this brief recapitulation, we see all three of the classic hallmarks of a true OOPL—polymorphism, inheritance, and encapsulation—and we also see that they follow naturally from the fundamental concepts of objects and classes. The mere fact that a class can contain more than one method and thus respond to more than one type of message yields polymorphism. The ability of a class to exploit methods defined in its ancestors (by the simple strategy of passing onward a message it doesn't know how to handle) is the very essence of inheritance. And the "black box" nature of a class and its objects—that messages go in and messages come out, but an object's methods

and private data are not directly accessible by any other object—is the epitome of encapsulation.

Although the pure object-oriented programming languages implement polymorphism, inheritance, and encapsulation in an exceedingly elegant manner, this elegance has brought them more critical acclaim than market share, and language vendors can't take critical acclaim to the bank. No doubt this was one of the primary reasons Bjarne Stroustrup decided to graft object-oriented capabilities onto the existing C language and ride piggyback on its rapidly growing popularity, instead of inventing yet another OOPL of his own. We are told by C++'s partisans that it is a multiparadigm language; in other words, it can be used both for traditional, procedural programming in the C style and for object-oriented programming. This claim ought to set off an alarm bell or two in your head immediately, but more about that later in this article. In the meantime, let's venture a little further into the weird and wonderful world of C++ by looking at operator and function overloading, which is the foundation of polymorphism in C++.

OVERLOADING IN C

When we say that an operator or function name is *overloaded*, we mean that the symbol can be used in two semantically different ways, and the compiler will figure out the proper code to generate. The C language has a certain amount of operator overloading built-in, although this is something that most C programmers never even think about. Consider, for example,

Power Programming

the following snippet of C code:

```
int i1, i2, i3;
long l1, l2, l3
double f1, f2, f3
```

```
i1 = i2 + i3;
l1 = l2 + l3;
f1 = f2 + f3;
```

When the compiler runs into the + operator, which is overloaded, the code that it generates is determined by the data types of the items being added. The following line

```
i1 = i2 + i3;
```

is translated into code like the following:

```
mov ax,i2
add ax,i3
mov i1,ax
```

Similarly, the line

```
i1 = i2 + i3;
```

is translated to code of this sort:

```
mov ax,word ptr i2
mov dx,word ptr i2+2
add ax,word ptr i3
adc dx,word ptr i3+2
mov word ptr i1,ax
mov word ptr i1+2,dx
```

And the line

```
f1 = f2 + f3
```

results in this code:

```
fld qword ptr f2
fadd qword ptr f3
fstp qword ptr f1
```

If you mix data types on an overloaded operator, the compiler looks even smarter; it will automatically produce code that coerces data types as necessary and then adds the results. For example, when faced with this mixture of three data types

```
f1 = i1 + l1
```

the compiler forges ahead anyway and produces

```
mov ax,i1
cwd
add ax,word ptr l1
adc dx,word ptr l1+2
mov word ptr temp,ax
mov word ptr temp+2,dx
fld dword ptr temp
fstp qword ptr f1
```

However, the overloading of C's + operator is more limited than it appears at first. It would be nice to be able to write statements like

```
char * string1;
char * string2 = "ABC";
char * string3 = "DEF";

string1 = string2 + string3
```

But this interpretation of the + operator was not hardwired into the compiler, so you just get the error message "Invalid pointer addition." The compiler isn't even smart enough to handle perfectly reasonable extrapolations of operations it al-

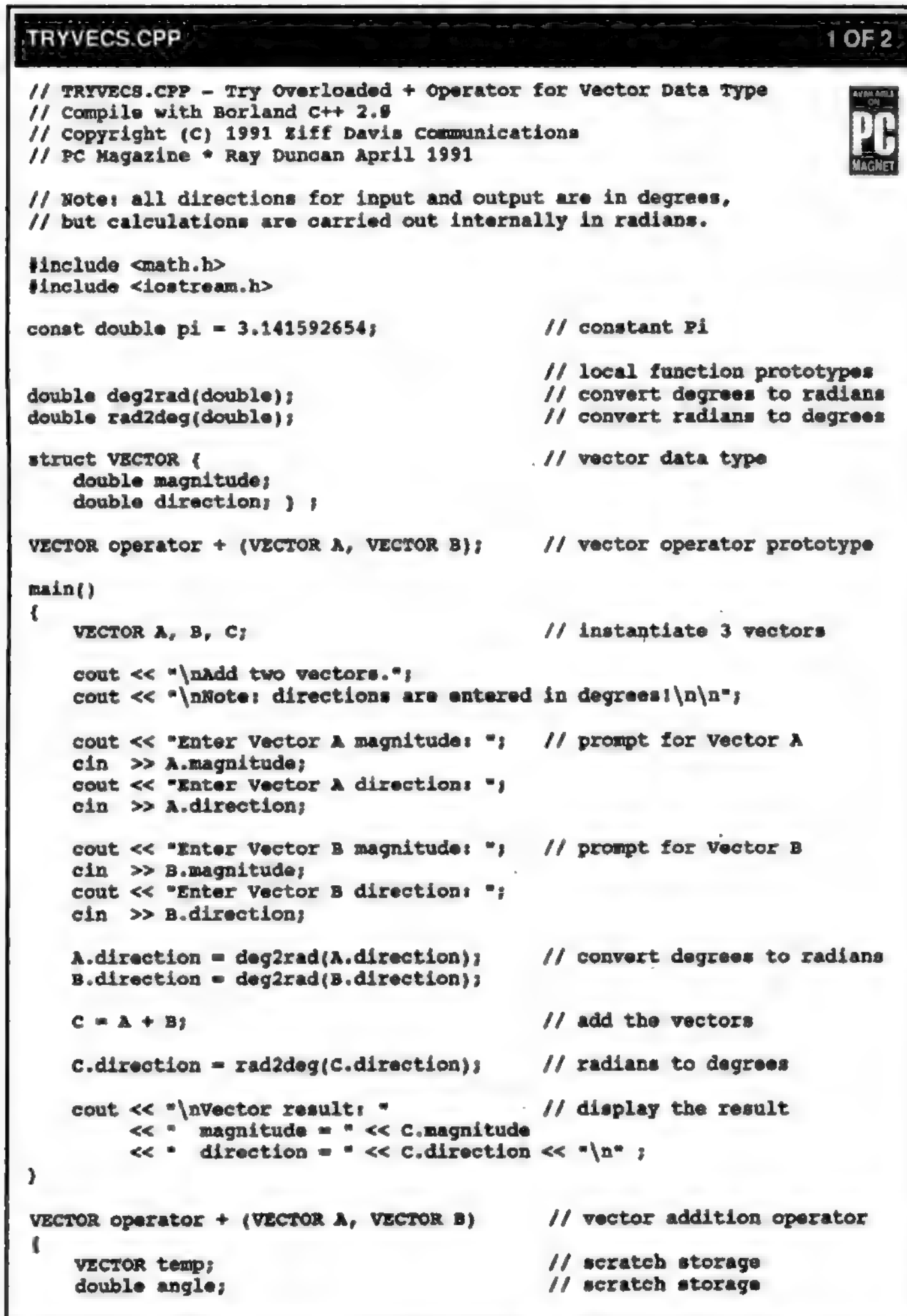


Figure 1: TRYVECS.CPP is an interactive program written in Borland C++ 2.0 that demonstrates operator overloading. TRYVECS prompts you for two vectors, adds them together, and displays the resulting vector.

Power Programming

TRYVECS.CPP

2 OF 2

```
angle = B.direction - A.direction;    // find angle between vectors
if (angle == pi)                        // special handling to avoid
{                                       // overflow for angle=180
    temp.magnitude = fabs(A.magnitude - B.magnitude);
    temp.direction = A.magnitude > B.magnitude ? A.direction : B.direction;
    return temp;
}

if ((A.magnitude == 0) && (B.magnitude == 0))
{
    temp.magnitude = 0;                // special handling to
    temp.direction = 0;                // avoid divide by zero
    return temp;                       // if both magnitudes = 0
}

temp.magnitude = sqrt(                // find magnitude of result
    (A.magnitude * A.magnitude) +
    (B.magnitude * B.magnitude) +
    (2 * A.magnitude * B.magnitude * cos(angle)));

temp.direction = A.direction +        // find direction of result
    asin((B.magnitude * sin(angle))/temp.magnitude);

return temp;                          // return resultant vector
}

double deg2rad(double degrees)        // convert degrees to radians
{
    return ((degrees * 2 * pi)/360);
}

double rad2deg(double radians)        // convert radians to degrees
{
    return ((radians * 360)/(2 * pi));
}
```

ready knows, such as the following:

```
struct point {
    int x;
    int y;
    int color; } ;

main()
{
    // declare 3 points
    struct point A, B, C;
    // add the points
    A = B + C;
}
```

This code makes the compiler choke, with the error message "Illegal structure operation." And since all overloading in C is hardwired by the compiler's author, and each instance of overloading is handled as a special case with magical code generation, there's no way for the applications programmer to extend the compiler by defining new capabilities for an operator, let alone new operators.

As for overloading function names,

forget it; a C compiler can't handle that. If you want functions that do symmetric things with different data types, you must give each function a distinct name. For example, it would be convenient to have a single display function, `print()`, that could identify the data type passed to it and convert the value to ASCII accordingly. But in C, you can't accomplish this in any natural way; you must code a set of parallel functions in this way:

```
void lprint(int i)
{
    printf("%d", i);
}

void lprint(long l)
{
    printf("%ld", l);
}

void fprint(double f)
{
    printf("%f", f);
}
```

The burden is on you to remember the proper function name for the type of data you want to display.

OVERLOADING IN C++

To me, the fundamental difference between C and C++—and the feature that makes object-oriented programming possible in C++—is C++'s treatment of overloading. C++ not only allows the programmer to overload functions and operators, it actively encourages doing so.

An intrinsic operator can be overloaded to service a new data type by providing a formal operator prototype (much like a function prototype) with an operator keyword, specifying how the operator behaves by providing a routine to implement the operator's new behavior, and using the operator in the "expected" manner. For example, if we want to overload the `+` operator so that it can be used to add vectors, a skeleton of our program would look something like this:

```
// declare vector data type
struct VECTOR {
    double magnitude;
    double direction; } ;

// vector addition operator
prototype
VECTOR operator + (VECTOR A,
    VECTOR B);
```

```
main()
{
    // create 3 vectors
    VECTOR A, B, C;
    // add the vectors
    C = A + B;
}

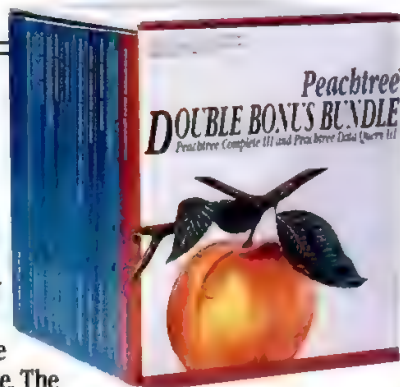
// this routine implements vector
addition
VECTOR operator + (VECTOR A,
    VECTOR B)
{
    ... // vector-specific code here
}
```

To illustrate this concept in more detail, I've provided the example program TRYVECS.CPP in Figure 1. TRYVECS implements the vector addition operator in the context of a little interactive demonstration program that prompts you to enter two vectors, adds them, and then displays the resulting vector. You can compile TRYVECS with Borland's C++ 2.0 package. A sample session with

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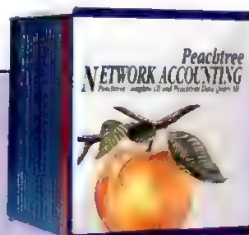


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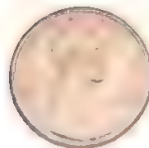


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A TRYVECS EXAMPLE

```
C>tryvecs

Add two vectors.
Note: directions are entered in degrees!

Enter Vector A magnitude: 100
Enter Vector A direction: 45
Enter Vector B magnitude: 100
Enter Vector B direction: 135

Vector result:  magnitude = 141.421356  direction = 90

C>
```

Figure 2: A sample session with the TRYVECS demonstration program.

TRYVECS is shown in Figure 2 above.

Functions are even easier to overload. You don't have to use a special keyword as you do with operators; you just create the different incarnations of the function with the appropriate prototypes and function declarations. To implement the "smart" print function we mentioned earlier, we could just write:

```
// function prototypes
void print(int);
void print(long);
void print(double);
```

```
.
.
.

void print(int i)
{
    printf("%d", i);
}
```

```
void print(long l)
{
    printf("%ld", l);
}
```

```
void print(double f)
{
    printf("%f", f);
}
```

We can then invoke print() with any of the three specified data types, and it will perform correctly:

```
print(1);
print(2000000L);
print(3.14159);
```

If you call an overloaded function with a

parameter whose type matches none of the function declarations, C++ will find the function that matches most closely and perform the necessary data conversions.

There are surprisingly few constraints on the overloading of functions. The most important requirement is that overloaded functions not differ only in the type of the value they return; they must differ in at least one of their formal parameters. This is because both the C and C++ programming languages allow the return values of any function to be ignored at the caller's discretion. For example, it would not be legal to overload our print() operator as follows:

```
// function prototypes
void print(int);
int print(int);
```

```
.
.
.

void print(int i)
{
    printf("%d", i);
}

int print(int i)
{
    printf("%d", i);
    return i;
}
```

The restrictions on overloading of operators are more extensive:

- The operator must already exist in the language (you can't dream up completely new operators).
- You can't define a new action for an

intrinsic operator on a native C++ data type; for instance, you can't change the way the + operator works on two ints.

- You can't change the precedence of intrinsic operators when you overload them.
- You can't overload operators with different prefix and postfix actions (despite the fact that C++ itself has such operators).

- You are not allowed to overload the operators ., .*, ::, and ?: (you may not have heard of :: yet, but you will soon enough).

By this time, I'm sure you can see that operator and function overloading alone have the potential to improve the readability of programs immensely. If Stroustrup had limited his redesign of the C language to the syntactic improvements we discussed in the last column and the overloading that we've covered here, he would have given us a far more powerful, somewhat extensible language without (in my opinion) any significant flaws. But the result would still have been a traditional procedural language—a sort of Super-C. It was Stroustrup's further addi-

**Stroustrup's addition
of notations for
object declaration
and inheritance
turned C++ into
a true—and
cryptic—OOP.**

tion of notations for object declaration and inheritance that turned C++ into a true OOP and incidentally into one of the most grotesque and cryptic programming languages man has ever created, as we'll see in the next two installments of this column.

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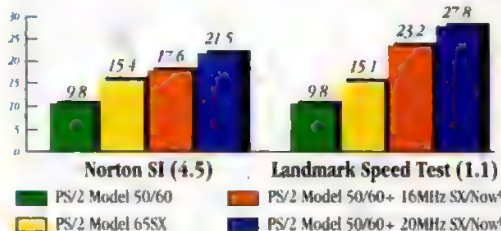
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by
Fran Finnegan

Windows

PREVIEW AND DIGITAL FONTS

I'm using *Microsoft Excel*, Version 2.1c, with *Microsoft Windows* 3.0. When I load Paintbrush after loading *Excel*, the Paintbrush font menu lists a strange entry called Preview; much less often I also find one called DIGITAL.

Preview offers several pixel sizes. The smallest, 6, produces characters that are unrecognizable blobs. The largest is 30, and 24-pixel type delivers text that appears—in both size and form—identical to 20-pixel Courier. DIGITAL displays nothing but seven-segment numerals, that is, numbers composed of 2 to 7 line segments.

I'm not sure why these fonts appear when they do, and I can't find a way to *deliberately* install either one. This is unfortunate, because both could be useful for special effects. Also, when I do have the chance, I don't feel comfortable using them, as I can't be sure they'll always be available.

What invokes these fonts, what are they used for, and is there a way I can install them myself?

James C. Meier
Cedar Rapids, Iowa



Preview is the typestyle that *Excel* and *Word for Windows* use to show you the full-page view of each page of a document prior to printing. The Preview that appears in Paintbrush is not really a *typeface* in the sense that Courier is a typeface. It is rather a label indicating the purpose of the font: previewing a document's layout. The second typeface, DIGITAL, is the one used by the Clock application when you select the digital setting. Its only purpose is to represent LED-looking digits, so those are the only characters stored in the font.

Before we discuss how Meier got these fonts, it will be helpful to elaborate on the concept of font files. A font file is a collection of the bitmaps or vectors that make up the physical font. In *Windows*, font files have an .FON extension, and

■ **PREVIEW AND DIGITAL FONTS:** Where do they come from and how can you load them explicitly?

■ **GET RID OF THOSE TEMPORARY FILES:** If you reboot your machine before exiting *Windows*, you could be saddled with space-eating .TMP files. Here's how to avoid the entire business.

since each of these .FON files may contain one or more—even up to hundreds of—fonts, the external filename is not always indicative of the contents of the file. The individual fonts in these files can be raster/bitmap (as are those of the Courier, Helv, Symbol, and Tms Rmn typefaces) or vector fonts (Modern, Roman, and Script).

Raster/bitmap fonts are actual pixel representations. They are faster to draw because the process is simply a matter of copying pixels to the screen. The *Windows* font mapper can actually enlarge a font by multiplying each pixel integrally—in other words, where there was one pixel, there is now two or three and so on up to five. This integral scaling can also leave the fonts grainy-looking at larger sizes. Vector fonts are composed of a series of lines, which can be infinitely scaled. Drawing them is a longer process because line-drawing commands take more time than simply copying pixels. But because they are not based on pixel sizes, vector fonts have a much smoother look. Both DIGITAL and Preview are raster/bitmap fonts.

Font files are usually stored in the *Windows* SYSTEM subdirectory, but they can also be found in the directories of individual applications. The Preview font

file, for instance, is stored in the *Excel* (or *Word for Windows*) directory with the name PREV.FON. This file contains four sizes of the Preview typestyle: 1 by 3, 2 by 4, 3 by 5, and 4 by 6 pixels. You can see each size in the Preview window of *Excel* or *Winword* if your document used a wide range of type point sizes. DIGITAL, on the other hand, is placed in the main *Windows* directory. The Setup program places it there (rather than in the SYSTEM subdirectory) because CLOCK .EXE is placed in the main directory. DIGITAL.FON contains only one size of the Digital font: 6 by 12 pixels.

Although the Preview and DIGITAL font files contain a number of type sizes, you can see more sizes in Paintbrush because of the integral scaling mentioned earlier. That is why you see 11 Preview sizes and 5 DIGITAL sizes in the Paintbrush Size menu. For Preview, you would multiply each of the four pixel sizes by two, three, four, and five and then subtract duplicates (as well as size 3, 4, 5, and 25, which Paintbrush doesn't produce); for DIGITAL, you would just multiply the one size by the same four factors.

By now you know plenty about the fonts themselves, but the question remains as to when particular ones are available. This has to do with the way in which *Windows* loads fonts. In *Windows*, fonts are loaded in either of two ways: automatically at start-up or upon request by an application at runtime.

Preloaded fonts are referenced in the SYSTEM.INI file's [Boot] section and WIN.INI's [Fonts] section. The ones listed in SYSTEM.INI are the special-purpose system fonts; the WIN.INI fonts are considered *general-purpose* fonts. The difference between the two types is that system fonts are required—used by elements like dialog boxes and menus—and all others are optional. The fonts listed in these .INI files are always available for any applications.

You won't find the Preview and DIGITAL fonts listed in these .INI files. They

Windows

are loaded by the second method. *Excel* and *Winword* both load PREV.FON, and *Clock* loads DIGITAL.FON, when those applications are launched. And once loaded, the fonts are—like system and general-purpose fonts—available to *all* applications. Thus the availability of these fonts is contingent on your loading specific applications. And this is why you find the erratic appearance of DIGITAL and Preview on the Paintbrush Font menu. What's more, if a font is loaded explicitly, it *may* be unloaded explicitly (at the option of the loading application). Neither *Excel* nor *Winword* unload PREV.FON. DIGITAL.FON is, however, unloaded by *Clock*. It is for this reason that Meier finds DIGITAL even less than he finds Preview. The former remains available to Paintbrush *only* while *Clock* is loaded.

So how do you arrange it so that PREV.FON and DIGITAL.FON load automatically at *Windows* start-up? By inserting new entries in the [Fonts] section of WIN.INI. The Fonts selection of

the Control Panel allows you to view the fonts listed in the WIN.INI file. It also lets you easily add new fonts or remove existing ones. To add PREV.FON, choose Add, move to either the *Excel* or *Winword* directory, and then select PREV.FON. Note: It's better to use the the *Excel* 3.0 PREV.FON file, because it's newer than and fixes some errors in the *Winword* 1.1 PREV.FON. Generally, you should choose the PREV.FON with the most recent date.

After you've added the font, the line

Preview=PREV.FON

(or one similar) will be inserted into the [Fonts] section of WIN.INI. That will install PREV.FON. Unfortunately, you cannot add DIGITAL.FON the same way. An error in the DESCRIPTION field of the file's header causes the Control Panel to choke.

Instead, you'll have to add the font entry to WIN.INI manually. (Remember that you should always make a backup of WIN.INI before you change anything.) Simply add the line

Digital=DIGITAL.FON

to the end of the WIN.INI [Fonts] section. Upon making any manual changes, restart *Windows*. By adding such a line for Preview, DIGITAL or any other .FON file you come across, you'll always have the referenced font available for all *Windows* applications.

After using either method to update the WIN.INI file, you should make sure that all the newly referenced .FON files are located in the *Windows* SYSTEM directory with the other .FON files. Even though I myself do not have PREV.FON or DIGITAL.FON load automatically at *Windows* start-up, I have placed both of them in the SYSTEM directory. This move ensures that they'll be found when the applications explicitly load them—an action that's not guaranteed if you leave the files in the application's directory. *Excel* 3.0 has a bug in this regard; if the *Excel* directory is not on your environment PATH, it may or may not load the PREV.FON file.

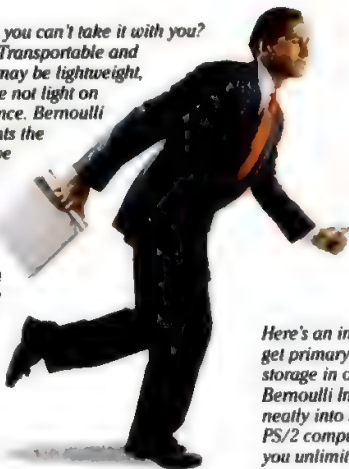
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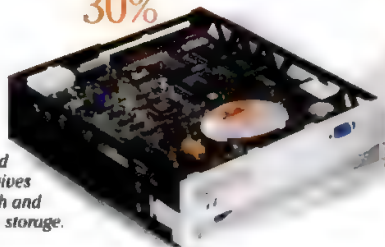


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Windows

looking files with a nonsensical filename and a .TMP extension in the *Windows* temporary-file directory (usually created by the user as C:\TEMP or C:\WINDOWS\TEMP). But beware: If you turn your computer off or reboot it before you have exited *Windows*, these files will not be deleted.

Allowing these files to accumulate could cost you in wasted disk space. These files are sometimes created even if a permanent swap file is used. Generally it is safe to delete the files that have a time and date stamp different from your current *Windows* session.

John Castravet
Howell, New Jersey



I find it convenient to have all my temporary files stored on a RAM drive (created by the RAMDRIVE.SYS device driver that comes with *Windows*). Using the RAMDrive utility will not only speed up the performance of *Windows*, but it will also free you from

having to worry about the temporary files created there. When you turn your machine off, the files on the RAM drive will be gone.

If you want to use a RAM drive, simply add the following line to your

**RAMDrive speeds
up the performance of
Windows and frees you
from worrying about
temporary files.**

CONFIG.SYS file:

```
Device=RAMDRIVE.SYS 1024 /e
```

This presumes that you have enough memory to create a 1MB RAM drive and sufficient memory left over for *Windows* to use. On a 4MB system, a 1MB RAM

drive is reasonable. This would leave 3MB for *Windows* and *Windows* applications. As is usually the case, the more memory you have, the better off you'll be.

You should also add the line

```
set TEMP=d:
```

to your AUTOEXEC.BAT file, where d: is the drive letter of the RAM drive to be created on your system. This tells *Windows* applications to put their temporary files on the RAM drive instead of on your hard disk in the C:\TEMP or C:\WINDOWS\TEMP directories.

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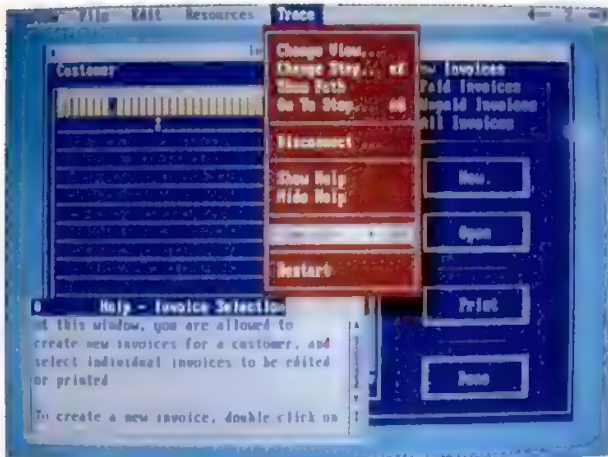


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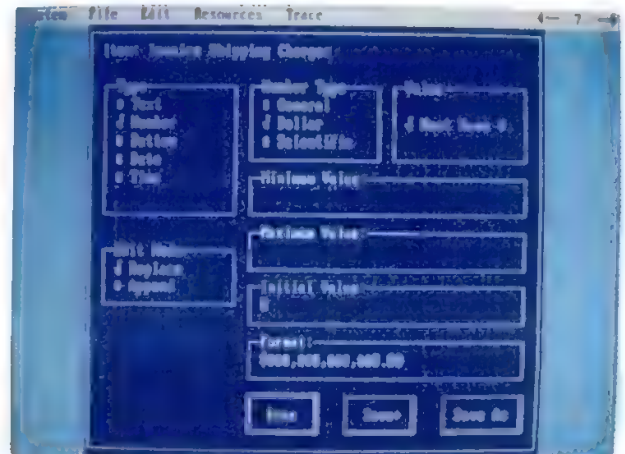
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by
Sal Ricciardi

Databases

CONSEQUENCES OF SET EXACT

With *dBASE IV*, it appears that Ashton-Tate tries to redefine a mathematical axiom: Perhaps $a=b$ does not mean $b=a$. Consider the following:

```
.STORE "RI" TO mname
.SET EXACT OFF
.SET FILTER TO ;
  UPPER(custname)=UPPER(mname)
.LIST custnum,custname
Record#  custnum custname
      1  04704  Rick
      12  07215  Rick
.SET FILTER TO ;
  UPPER(mname)=UPPER(custname)
.LIST custnum,custname .
```

As you can see, no records result from the second filter and list.

Gordon Shephard
Coquitlam, British Columbia,
Canada



Every *dBASE* programmer puzzles over this mystery at least once. At times, *dBASE* can make it appear that $a=b$ but $b \neq a$. The immediate reaction is usually astonishment, followed by a strong temptation to scream "Bug!" Not true, and needless to say, there is a reasonable explanation.

The reason has to do with the SET EXACT setting and the way *dBASE* performs comparisons. We'll look first at how it works with SET EXACT OFF—usually the default. Consider this:

```
.SET EXACT OFF
. ? "Ralph" = "Ra"
.T.
```

With SET EXACT OFF, *dBASE* compares the string on the left to the string on the right one character at a time, but only for the length of the string on the right. So, in this instance, only two comparisons are made (the length of "Ra") and the result is True: The first two characters on the left are equal to the first two on the right.

■ **CONSEQUENCES OF SET EXACT:** Discover how the SET EXACT setting affects string comparisons in *dBASE*.

■ **THE RIGHT-SIZE CHAR FIELDS:** Find out how much unused space is in your character field.

Similarly, if the expression on the right is a null string, as in

```
.SET EXACT OFF
. ? "Ralph" = ""
.T.
```

dBASE considers the strings equal since no comparisons are made—the length of the string on the right is 0. With SET EXACT OFF, all tests for equality with a null string on the right are true. This is why programmers often place the null string to the left side of the equal sign when testing for empty strings. For example,

```
IF (" " = memvar)
...
ENDIF
```

will work correctly regardless of the SET EXACT setting. But

```
IF (memvar = "")
...
ENDIF
```

will not produce the desired result when SET EXACT is OFF.

Finally, consider the following:

```
.SET EXACT OFF
. ? "Ralph" = "Ralphs"
.F.
```

This returns FALSE because *dBASE* compares for the full length of the string on the right. Since it's one more than the string on the left, they are not equal.

The second filter in Shephard's example failed for the same reason, because the "RI" was moved to the left of the equal sign, and *dBASE* compares for the full length of the string on the right ("RICK").

The intent of this apparent enigma is to provide flexibility when searching for data. With SET EXACT OFF you can match on a partial string instead of having to know *exactly* what it contains.

For example, consider a last-name search:

```
.SET EXACT OFF
.USE NAMES
.LIST TRIM(LAST)+", "+TRIM(FIRST)
      TRIM(FIRST) FOR LAST = "Sm"
```

Your results might look something like:

```
Record#
TRIM(LAST)+", "+TRIM(FIRST)
      4  Smacker, Sue
      5  Smedley, Sam
      6  Smith, Steven
      7  Smith, Stuart
      8  Smith, Stanley
      9  Smothers, Tom
     10  Smudley, Solomon
```

This can be quite handy for identifying subsets and for locating data when you know only the first few characters.

It can also be useful for finding indexed data based on a partial key expression. For example, using an index file with SET EXACT OFF, you can use

```
SEEK "Sm"
```

to locate the first match that starts with "Sm".

With SET EXACT ON, *dBASE* compares the string on the left to the string on the right one character at a time, and both

Databases

strings must be the same length. They must match *exactly*, except that trailing blanks are ignored. For example:

```
.SET EXACT ON
.? "Sal" = "Sal  "
.T.
.? "Sal  " = "Sal"
.T.
.? " Sal  " = "Sal"
.F.
```

The first two both return true since, after trailing blanks are removed, both strings are exactly equal. The third returns false since there is a blank space in the front of the left string. Only *trailing* blanks are removed.

Consider again the last-name search shown above. With SET EXACT ON there are no matches, since there are no entries with a last name of just "Sm":

```
.SET EXACT ON
.USE NAMES
.LIST TRIM(LAST)+", "+;
      TRIM(FIRST) FOR LAST = "Sm" .
```

Generally speaking, use SET EXACT ON to be sure you are affecting only the records you want to. Use SET EXACT OFF for flexible searches that are read-only in nature.

FoxPro and *Clipper* both include a special operator, **==**, that performs exact comparisons. With this operator both strings have to match exactly, including trailing blanks, to be considered equal. This is extremely handy, since you can SET EXACT OFF at the start of your program and use the **==** operator where exact matches are required.

THE RIGHT-SIZE CHAR FIELDS

After trying Donald Chambless's excellent program in the November 13, 1990, Databases column, I came up with a technique that produces more information about the potential for saving disk space, and runs faster, too. The program, **FIELDSIZ.PRG**, is shown in Figure 1.

The program will run without modifications in *dBASE III Plus*, *dBASE IV*, *FoxBASE+*, *FoxPro*, and *Clipper*. You can call **FIELDSIZ** as follows:

```
DO fieldsiz WITH "filename"
```

FIELDSIZ.PRG

COMPLETE LISTING

```
* PROGRAM:  FIELDSIZ.PRG
* PURPOSE:  Find the smallest size a character field can be
*           without losing any current data.
*
* REMARKS:  You can call this program either from the dot prompt
*           or from inside another program.
*
* COMMAND:  DO FIELDSIZ WITH 'FILENAME' (dBASE, FoxBASE+...)
*           OR
*           FIELDSIZ FILENAME if compiled with Clipper

PARAMETERS filename
CLEAR
SET TALK OFF
SET STATUS OFF
CLOSE DATABASES
SELECT 1
USE &filename
? "File: "+filename+".DBF"
? "Optimum structure:"
?
msavtot=0
maux=1
DO WHILE LEN(FIELD(maux))>0
  IF TYPE(FIELD(maux))<>'C'      ** Check if the field is of Type "Char"
   iaux=iaux+1                ** If not, goto next field
  LOOP
  ENDDIF
  mtotal=0
  mname=FIELD(maux)
  GOTO TOP
  DO WHILE .NOT. EOF()
    IF LEN(TRIM(mname))>mtotal
      mtotal=LEN(TRIM(mname))
    ENDIF
    SKIP
  ENDDO
  msaved=(LEN(mname)-mtotal)*RECCOUNT()
  msavtot=msavtot+msaved
  msg=IIF(msaved>0," bytes to save"," no change on this field")
  ? RIGHT(SPACE(18)+TRIM(FIELD(maux)),11),mtotal,STR(msaved)+msg
 iaux=iaux+1
ENDDO
?
? "Total number of bytes that can be saved: " + LTRIM(STR(msavtot))
CLOSE DATABASES
RETURN
```

Figure 1: The **FIELDSIZ** program analyzes a .DBF and reports the maximum current usage for each character field.

where *filename* is the name of the file you want to test. Note that a .DBF file extension is *not* used. If you compile **FIELDSIZ** into a standalone .EXE using *Clipper*, use the following command:

```
fieldsiz filename
```

Credit is due Chambless for the original concept.

Claudio P. Ferreira
Washington, D.C.



This is another approach to finding out how much wasted space there is in your .DBF file character fields. The **FIELDSIZ** program analyzes the data in each character field and reports the maximum current usage. For example, if you have a 50-byte character field defined and the most you've used in any given record is 31, **FIELDSIZ** reports 31. This means you may have overestimated your field size requirement by 19 bytes. Of

course, you may want the extra space anyway, but **FIELDSIZ** lets you see how much is currently being used.

Mr. Ferreira's program is indeed faster and provides an estimate of the disk space savings you can obtain should you decide to modify the .DBF structure and reduce the size of your character fields. If you've badly overestimated the requirements, the savings could be significant.

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by
Craig Stinson

Spreadsheets

ELIMINATING THE NEGATIVE ZERO

In one section of a *Lotus 1-2-3*, Release 2.2, worksheet, I have a formula that adds the numbers 4707.48 and 2353.74. The result displayed is 7061.22. Elsewhere in the same worksheet, I subtract 7061.22 (entered as a constant) from this result, and 1-2-3 displays

-0.00

I find this negative zero most annoying! Why do I get it and how can I get rid of it?

William Lukang
Makati, Philippines

PC All spreadsheets receive and display numbers in decimal notation but store them as binary values—sequences of zeros and ones. Negative zeros and other round-off anomalies occur because most numbers cannot be converted exactly between the base 10 and base 2 systems. Figure 1 shows what's going on in Lukang's example.

Columns A and B contain identical data. I've applied the /Range Format Text command to column A so that you can tell which entries are constants and which are formulas. In column B, the data is reset to display only results and is formatted to display 15 digits of precision, the maximum allowed by 1-2-3.

As rows 1 and 2 show, when 4707.48

- **ELIMINATING THE NEGATIVE ZERO:** Use the @ROUND function to get rid of anomalies that arise from decimal/binary number conversions.
- **MORE PROBLEMS WITH NONINTEGERS:** Watch out for round-off anomalies when comparing numbers with @IF.
- **ROUNDING OFF THE BEATEN PATH:** An @ROUND formula lets you round off to the nearest 10, 25, 152, or any number you want.

and 2353.74 are entered as constants, 1-2-3 stores binary values more nearly equivalent to 4707.480000000000587 and 2353.740000000000294, respectively. The formula that adds these constants yields something approximating 7061.220000000000369. When 7061.22 is entered as a constant, the value recorded by 1-2-3 is more or less 7061.2200000000001278. And when that

approximation of 7061.22 is subtracted from the approximation generated by adding approximately 4707.48 and approximately 2353.74, the result is a shade less than 0. Formatting this result to two digits of precision produces the -0.00 that bedevils Lukang.

Don't blame 1-2-3, Release 2.2; you'll get exactly the same results in *Quattro Pro*, *Microsoft Excel*, and most other spreadsheet programs. These apparent inaccuracies are not due to insufficient computing resources; they're inherent in the conversion of values between the binary and decimal numbering systems. 1-2-3, Release 3, computes with more precision than Release 2 (18 digits for Release 3, 15 for Release 2), but it, too, gives -0.00 as the result of Lukang's subtraction formula. Release 3 uses 18 digits for calculation and storage but displays a maximum of 15 digits, so the inputs to Lukang's problem will always be displayed as exact integers. However, the final result will still be less than zero.

Lukang can easily solve his problem by applying the @ROUND function. In Figure 1, for example, modifying the formula at B7 to make it read

@ROUND(B5-B6, 2)

will produce a true-blue zero.

MORE PROBLEMS WITH NONINTEGERS

I recently encountered a problem with *Quattro* (the original version, not *Quattro Pro*). In my spreadsheets, I use an @IF function in the formula

@IF(@SUM(column)=@SUM(row),
@SUM(column), @ERR)

to prove the integrity of the worksheet. In some parts of the worksheet, the formula appeared to work flawlessly. In others, however, it detected spurious fractional differences between the sum of the columns and the sum of the rows and conse-

THE NEGATIVE ZERO		
	A Entry	B Result
1		
2		
3	4707.48	4707.480000000000587
4	2353.74	2353.740000000000294
5	+A3+A4	7061.220000000000369
6	7061.22	7061.2200000000001278
7	+A5-A6	-0.000000000000909

Figure 1: Spreadsheet programs store and display numbers in two different formats. Converting noninteger values between the two systems can cause minute differences between numbers that should be the same—B5 and B6 in the above worksheet. The spurious difference is displayed in B7.

Spreadsheets

quently returned the value ERR.

I knew that the errors resulted from a problem in manipulating floating-point numbers. To correct this, I used the @ROUND function to lop off the problematic fraction. Unfortunately, my @IF function still returned ERR! So while I've identified the conditions of the problem, I haven't found a solution. Can you help?

Douglas D. Linton
Long Beach, California



Unfortunately, *Quattro* has no monopoly on this kind of problem. As I explained in answer to Lukang's question above, all spreadsheet programs accept input and return output in decimal notation but store and manipulate binary values. Many noninteger (floating-point) values cannot be converted exactly between the two numeric systems. Thus, it often happens that two mathematical operations that should produce identical results produce results that differ by a hundred millionth or so.

When you use the @IF function with an equals operator—as, for example, in @IF(A1=B1,true_result,false_result)—even the smallest divergence from equality causes the function to return the false result. Therefore, validating calculations with @IF can be troublesome. One way to eliminate the hazard is to build a tolerance factor into the @IF test. For example, Linton's problem can be solved by changing the formula to read

```
@IF (@SUM (column) - @SUM (row)
<1E-6#OR#@SUM (row) - @SUM (column)
<1E-6, @SUM (column), @ERR)
```

Or you can include calls to @ROUND within the @IF formula, like this:

```
@IF (@ROUND (@SUM (column), 6) = @ROUND
(@SUM (row), 6), @SUM (column), @ERR)
```

Applying @ROUND to the numbers involved in your calculations does not help, because it merely reduces the precision of the inputs. The numbers still have to be converted from decimal to binary notation and back. As I pointed out in the answer to Lukang's letter, however, @ROUND can be handy for cleaning up the worksheet display when subtracting one value from another generates -0.

ROUNDING OFF THE BEATEN PATH

A coworker wanted to produce a *Lotus 1-2-3* spreadsheet like the one shown in Figure 2, where results (in column E) are rounded to the nearest 25 (as displayed in column F). I came up with the following formula, which would be entered in cell F8

nearest multiple of ten, and so on. Thus, the function @ROUND(521,-1) yields 520, @ROUND(521,-2) yields 500, and @ROUND(521,-3) yields 1,000.

To round a number to the nearest multiple of 25 using @ROUND, you can multiply the number by 4 and round to the nearest 100—then divide the result by 4.



Figure 2: Column F shows the data in column E rounded to the nearest 25. The command line shows part of the unwieldy formula used to calculate the rounded values. The formula @ROUND(E8*4,-2)/4 will do the job just as well, and it can be amended to round to any number.

and copied to F9 and F10 (All cells are formatted to 0 decimal places):

```
@IF (@MOD (E8, 100) < 12.5, E8 -
@MOD (E8, 100), @IF (@MOD (E8, 100)
< 37.5, E8 - @MOD (E8, 100) + 25,
@IF (@MOD (E8, 100) < 62.5, E8 -
@MOD (E8, 100) + 50, @IF (@MOD (E8, 100)
< 87.5, E8 - @MOD (E8, 100) + 75, E8 -
@MOD (E8, 100) + 100)))
```

This formula can be modified to allow for other degrees of rounding—for example, to the nearest 50 or nearest 100.

Doug Bernart
Wilmington, Delaware



Bernart's set of IF statements works, but there's a much easier way to round to the nearest 25. The formula

```
@ROUND (E8*4, -2) / 4
```

does the trick rather nicely. It works because the @ROUND function has the ability to round numbers to the left, as well as to the right, of the decimal point. Asking *Lotus 1-2-3* to round a particular number to -2 decimal places means that you are asking it to round to the nearest multiple of 100. Rounding to -1 decimal places is equivalent to rounding to the

In general, to round the number x to the nearest multiple of n , use the formula

```
@ROUND (X*100/N, -2) *N/100
```

The factors $100/n$ and $n/100$ cancel each other out, leaving you with the rounded result you desire. Of course, you could also make the formula read

```
@ROUND (X*10/N, -1) *N/10
```

or

```
@ROUND (X*1000/N, -3) *N/1000
```

or even

```
@ROUND (X*.1/N, 1) *N/.1
```

These variations produce the same result.

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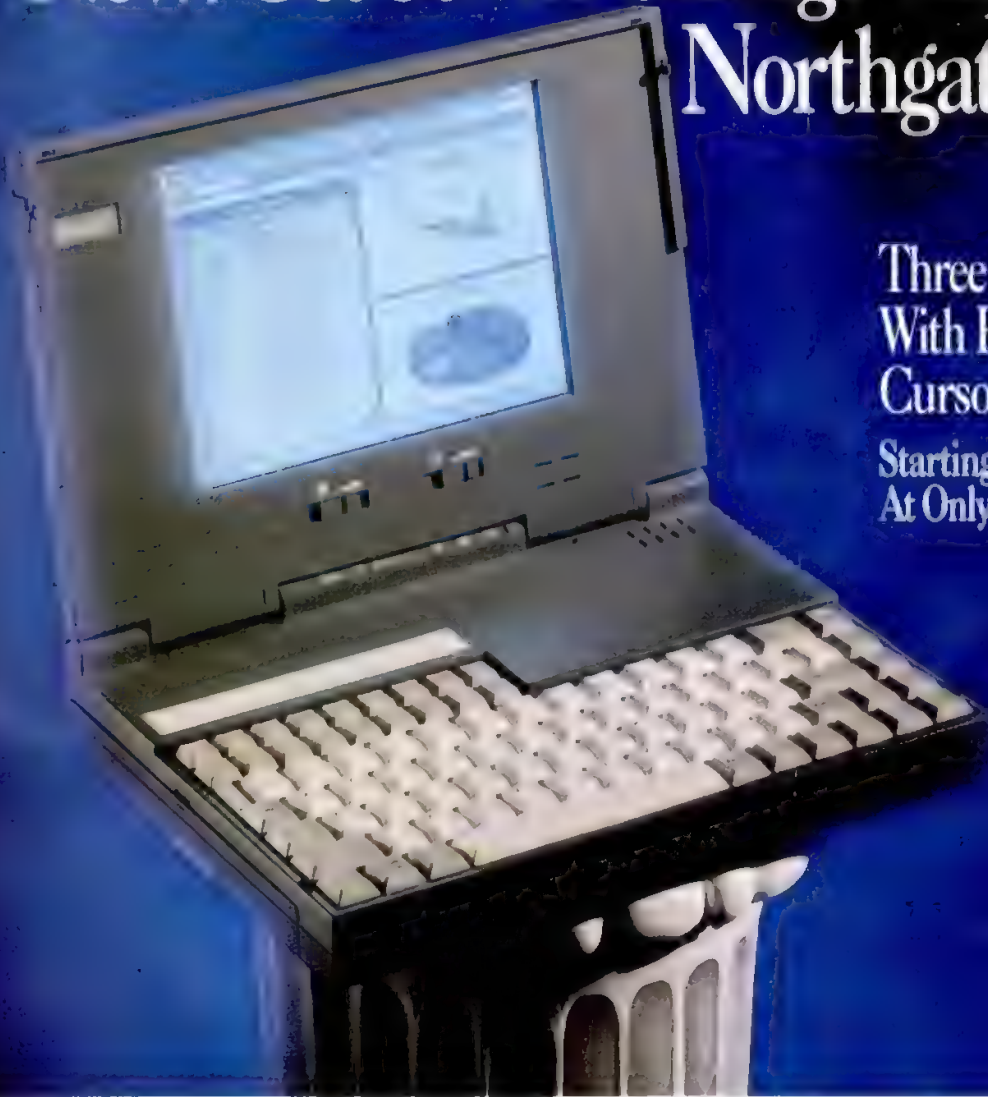
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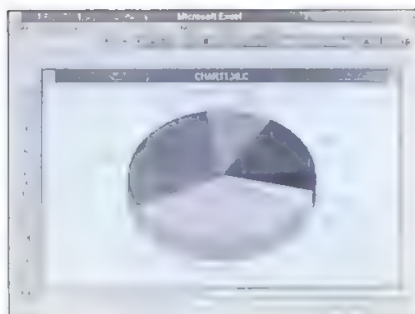
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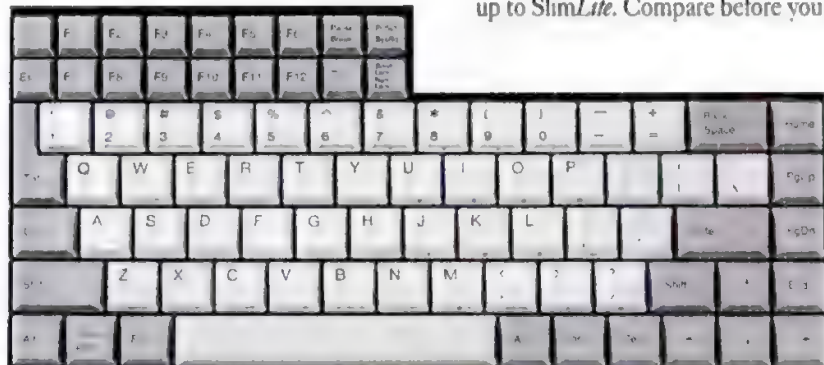
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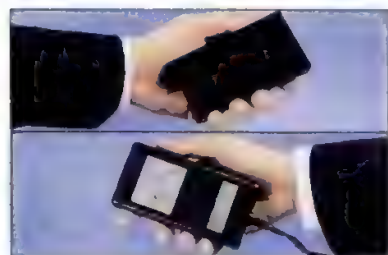
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The Working Word

You can buy software packages that generate calendars, but it's a snap to create one in *WordPerfect* 5.1 with CALENDAR.WPM (shown in Figure 1). You can make a calendar for any month between January 1980 and December 2099, and I've included an option that lets you highlight as many dates as you want.

The first part of the macro asks the user to enter the month and year of the calendar to be created. The computer's date is then reset to the first day of the

month and year just entered by using the DOSDATE command. The current date is saved to an ASCII file. The month and year entries are assigned into Variables 1 and 2, respectively. Then the original date is restored to the system.

The second section, starting with Paragraph 9, converts the number representing the month into the name for the month and then assigns the correct number of

The month and year are entered into the Equation Editor in order to create a title in large, 36-point characters. Below the title a table is created and the appropriate variables automatically entered for the correct number of columns and rows. Using the {FOR EACH} macro command, the names of the days are entered across the top of the table. Each row is widened vertically with three {Enter}s.

In the last part of the macro, the {Search} and {FOR} commands are com-




```
{IF}{VAR 1}=9{(ASSIGN)1"September"(ASSIGN)7"30"(END IF)
{IF}{VAR 1}=10{(ASSIGN)1"October"(ASSIGN)7"31"(END IF)
{IF}{VAR 1}=11{(ASSIGN)1"November"(ASSIGN)7"30"(END IF)
{IF}{VAR 1}=12{(ASSIGN)1"December"(ASSIGN)7"31"(END IF)
{IF}{VAR 2}41=84{(VAR 1)="February"(ASSIGN)7"28"(END IF)
    {}On a leap year give February
    a last day of 28."
{IF}{VAR 9}="Fri"&(VAR 7)>30{(ASSIGN)8"7"(END IF)
    {}If first day of the year
    (Variable 9) is a Friday and
    last day of the year (Variable
    7) is beyond the 30th, add row
    to calendar table (Variable 8).
{IF}{VAR 9}="Sat"&(VAR 7)>29{(ASSIGN)8"7"(END IF)

{}Paragraph-10: Make calendar title in Equations."
{Graphics}ECRfunc-{{(VAR 1)}(VAR 2)} {}Go into Equations editor and
enter month (Variable 1) and
year (Variable 2).
{Setup}1y2236{Exit}{Exit}{Exit}HCSA{Exit}
    {}Set text in 36 point type."
{Enter}{Enter}{Enter}{Enter}{Enter}{Enter}
    {}Exit Equations editor."

{}Paragraph 11: Make calendar table."
{Columns/Tables}TC7{Enter}{VAR 8}{Enter}{Exit}
    {}Create table with 7 columns
    and number of rows assigned
    to Variable 8."
{FOR EACH}8"Sun"Mon"Tue"Wed"Thu"Fri"Sat"
    {}For each column, type one of
    the following day names in order
    specified."
{Center}{Bold}{VAR 8}{Tab}{END FOR} {}Center and bold each day of week."
{Enter}{Enter}{Enter}{Down} {}Add three lines for each row."
{Enter}{Enter}{Enter}{Down}
{Enter}{Enter}{Enter}{Down}
{Enter}{Enter}{Enter}{Down}
{Enter}{Enter}{Enter}{Down}
{Enter}{Enter}{Enter}{Down}
{Enter}{Enter}{Enter}{Down}

{}Paragraph-12: Fill in the date."
{Home}{Home}{Up} {}Go to top of document."
{Search}{VAR 9}{Search}{Down} {}Search for first day of week
(Variable 9) and move cursor
into cell immediately beneath."
{FOR}8"1"(VAR 7)"1" {}For Variable 8, start with
number 1, and with the value
of Variable 7 (last day of
month), adding incrementally
by 1."
{Bold}{VAR 8}{Bold}{Tab}{END FOR} {}Bold the generated number,
placing a space before and
after the number."
{Down}{Del to EOF}y {}Move to next row, delete
any text."
```

```
{Paragraph-13: Clear intermediate files and all variables."
{List}{Enter} {}List files."
ngetdate.bat{Enter}{Del}y {}Find and delete getdate.bat."
ndi{Enter}{Del}y{Exit} {}Find and delete di file, exit."
{ASSIGN}8""{ASSIGN}1""{ASSIGN}2""{ASSIGN}7""{ASSIGN}8""{ASSIGN}9""
    {}Clear Variables of any values"

{}Paragraph-14: Option to highlight some particular date."
{CHAR}8"Calendar-is-done!
Do-you-want-to-emphasize-some-date?-(Y/N)"
    {}Place message onto screen."
{IF}{VAR 9}="N"|"N"{Page Up}{GO}q{END IF}
    {}If response is N or n, go
    to top of page, start q
    label, end macro."

{}Paragraph-15: Emphasize the date chosen."
{HPg} {}Create page break"
{Tab}{Bold}Please-enter-date,-using-space-between-two-dates{Enter}
{Tab}{examples-5-10-25}-then-ENTER{Enter}{Enter}
{Tab}start-below-the-line:{Bold}{HPg} {}Above text entered onto
page 2."
{END IF}{PAUSE}""{Block}{Page Up}{Page Down}{Macro Commands}38{Enter}
    {}After dates are entered, mark
    place with *, block dates,
    enter them into Variable 8."
{Home}{Home}{Up}{Page Down}{Del to EOF}y{Del}{Del to EOF}y
    {}Delete message and page break."
{VAR 8}{Page Up}{Page Down}
    {}Write Variable 8 to bottom
    of page."

{}Paragraph-16: Make shade on the date chosen."
{LABEL}L"
{Block}{Word Right}{Macro Commands}38{Enter}
    {}Block date to be shaded and
    enter into Variable 8."
{Home}{Backspace}{Page Up} {}Delete date."
{IF}{VAR 8}="*" ""{GO}q{END IF} {}If Variable 8 is the *, run
Label q to end macro."
{Search}{VAR 8}{Search}{Columns/Tables}L80{Columns/Tables}
    {}Otherwise search for date,
    go into Table edit, shade
    current cell and exit Table
    edit screen."
{Page Down} {}Go to next page (beginning
of list of dates to shade).
{GO}L" {}Loop Label L."

{}Paragraph-17"
{LABEL}q"
{ASSIGN}8""
{Replace}n{Bold}{Search}{Bold}{Search}
    {}Delete space in front of date."
    {}Clear Variable 8 of values."
    {}Eliminate space before
    each date."
{Page Up} {}Go to top of calendar."
{QUIT} {}End macro."
```

bined to fill the table with the month's dates. Then, a prompt appears at the bottom of the screen, giving you the option of shading any dates you choose. Enter the dates in any order you want and make sure they are separated by a space. Hit Enter *after* you type in the last number and not until then. The message is cleared from the screen. The date closest to the margin is blocked, assigned to a variable, and deleted. A search is made for that date within the table, and that cell is shaded. Any other remaining dates you've entered are also shaded. The macro ends with your calendar on the screen and the cursor at the top of the page.

Wenhuei Hu
Chicago, Illinois



Should your PC be less powerful than a 12-MHz 286, you may be tempted to take a coffee break while this handy macro is churning out a calendar. It can be slow, but the results are

well worth the wait, especially if you have access to a laser printer. Since the calendar is a table, you can add text to any cell before saving or printing it. Just place the cursor after the date and start typing. If your text exceeds four lines, the row you're on will extend vertically as you type. Of course, you also have the option of blocking text that exceeds your aesthetic limits and setting its size to Small or Fine using the Font Size (Ctrl-F8, S) command.

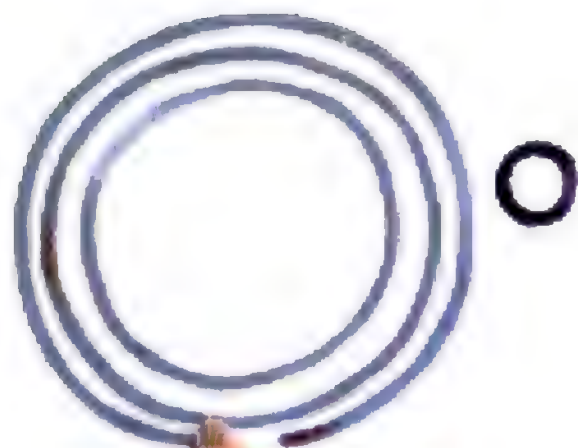
Clearing values from Variables, as done in Paragraph 1, is generally not necessary, since the Assign command replaces any existing value with a new value. But it also doesn't hurt to play it safe, knowing with absolute certainty that no stray value previously assigned to a variable will affect this macro.

The method used to capture the first day of the week a particular month falls on is rather clever. The only way to discover this is by changing the current date

of your PC to match the first day of the month and year you enter at the start of the macro. To do this, the macro saves the current date and the new date as ASCII files. A batch file is created that changes the date through the DOS Command function (Ctrl-F1, C). The new date is saved as a text file (dd) and the current date (file d1) is restored. Back in *WordPerfect* the new date file is retrieved. The day (Tue, for example) is blocked and saved as a variable. This is used to place the number 1 below this day.

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by
Neil J. Rubenking

User-to-User

AN EASY DIRECTORY TREE

DOSTREE.BAT will create a complete copy of your hard disk directory tree on virtually any size floppy disk (360K or larger)—without copying any files. Once a backup tree disk has been created, you can restore a blank hard disk with a complete directory tree in moments. DOSTREE requires versions of DOS that support XCOPY with the /S and /E options. Make a file called DOSTREE.BAT, containing the following single-line command:

```
XCOPY C:\{Alt-255}.\{Alt-255} A: /S  
/E
```

To enter the {Alt-255} characters, hold down the Alt key while typing 2 5 5 on the numeric keypad, then release the Alt key (don't type the curly brackets). {Alt-255} creates a blank space, but it's *not* the same blank space generated by the Spacebar.

DOSTREE uses XCOPY to search the C: drive for a file that probably doesn't exist—unless you use very unusual filenames. You don't have to use {Alt-255} as the filename; any filename XCOPY won't be able to find will do. The /S switch tells XCOPY to search all of the subdirectories, and the /E switch causes it to copy all empty subdirectories.

To make a directory tree backup, start with a bootable floppy that has system files installed, with COMMAND.COM and XCOPY in the root. Then run DOSTREE.BAT to copy the directory tree. To restore the directory tree on your hard disk, place your backup disk into drive A: and type the line:

```
XCOPY A: C: /S /E
```

You can make this process even simpler by placing that line in an AUTOEXEC.BAT file on the floppy. Then you just insert the disk and boot.

George Dodson
Glendale, California

- **AN EASY DIRECTORY TREE:** Use XCOPY to copy your hard disk directory structure.
- **WRITING PROGRAMS IN DEBUG:** A handy utility makes it easier to program in DEBUG.



The DOS manual states that the /E switch causes XCOPY to copy empty subdirectories, but it doesn't really mean empty. Without this switch, XCOPY will copy a directory only if it finds a matching file to copy within that directory. Empty means empty of matching files, not totally empty. That's why this tip works!

The command is so simple you don't need a batch file; you can just type it at the command line. Note that the Alt-255 process described above produces ASCII character 255, which *looks* like a space but isn't (the Spacebar produces ASCII 32). Of course, any filename that is not present on your disk will do.

I'm not entirely sure of the benefit of saving and restoring just the directory structure of a hard disk. This tip is probably more useful for *copying* the structure of an existing disk to a new hard disk. For example, if you want to set up a number of machines in the same way, it's handy to start by giving them the same directory structure. After that, you can install the appropriate software without having to remember whether you're using TP or TURBO as the name for the Turbo Pascal directory, and so on.

WRITING PROGRAMS IN DEBUG

Writing .COM programs with the help of DEBUG is often a frustrating experience because you can't use labels, so we created DEB2SCR.COM to alleviate this

frustration. Here's how you can use it.

Write a script of the program in the usual way, but insert labels at the destination of every jump and at the end of the code. These labels are simply comment lines starting with a semicolon (;). The script file should look like the following sample:

```
N SAMPLE.COM  
A  
lines of code  
;LABEL1  
lines of code  
;LABELn  
lines of code  
;END  
  
RCX  
nn  
W  
Q
```

At this stage, the addresses of the assembled code aren't known, so you use guess values as usual for the destination of every jump, as well as for the length of the code *nn*.

Normally, you'd feed the sample script into DEBUG and redirect the output to another file using the command:

```
DEBUG < SAMPLE.SCR > SAMPLE.OUT
```

The .OUT file contains the addresses of all the lines, but the syntax wouldn't be correct for a script file. To fix the jump addresses and the value for the length of the code, you'd have to work simultaneously with both the .SCR and .OUT files.

Instead use the command

```
DEBUG < SAMPLE.SCR | DEB2SCR >  
SAMPLE.SCR
```

DEB2SCR.COM is a filter that takes in the DEBUG output and then transforms the output into a new script file, retaining only the addresses of the labels. The SAMPLE.SCR file that results from this

process will have the following form:

```
N SAMPLE.COM
A
lines of code
;<XXXX> LABEL1
lines of code
;<YYYY> LABELn
lines of code
;<ZZZZ> END
```

```
RCX
nn
W
Q
```

where XXXX, YYYY, and ZZZZ are the offsets of the lines following the labels LABEL1, LABELn, and END, respectively.

This new file is easy to edit, since both the jump addresses to be corrected and the destination addresses are in a single file. The offset appearing with the END label determines the length of the code.

Now you redirect the new script file into DEBUG, and this ends the process if your program executes as expected. If it doesn't, make your corrections to the script file and try again. At each stage, the offsets appearing with the labels correspond to the previous assembly.

DEB2SCR makes the entire process much faster and has a further advantage: The final script file that remains when the program is finished clearly specifies the destination of every jump, making it much easier to read and modify in the future.

You can create DEB2SCR.COM by running its script file (shown in Figure 1). The script is extensively commented, and it includes labels. This file is actually the output of DEBUG filtered through DEB2SCR.

The coding of DEB2SCR.COM is straightforward. The program first loads the output of DEBUG into a huge buffer. The characters in this buffer are read and modified or skipped to conform to the script syntax; then they're sent to the output file. The only complication not readily apparent from the script is a peculiarity of DEBUG output. This output is not a regular ASCII file, since the lines usually (but not always) end with two CRs and one LF.

Constantino Grosse

Marcelo Vargas

San Miguel de Tucuman, Argentina



```
N DEB2SCR.COM
A
MOV     DX,0187          ; address of buffer
MOV     CX,F000          ; size of buffer
XOR     BX,BX
MOV     AH,3F            ; read text into buffer
INT     21
OR      AX,AX            ; number of bytes read = 0 ?
JNZ     0112             ; no --> PROCEED
;<0110> FINISH:
INT     20               ; end
;<0112> PROCEED:
MOV     CX,AX
ADD     CX,DX            ; CX = end of data in buffer
MOV     SI,DX            ; SI = address of byte read from buffer
;<0118> NEWLINE:
CMP     SI,CX            ; end of data reached ?
JNB     0110             ; yes --> FINISH
MOV     AL,[SI]          ; read character from buffer
CMP     AL,2D            ; is it a '-' ?
JNZ     0125             ; no --> CONTINUE1
INC     SI               ; skip the '-'
JMP     016E             ; --> OUTPUTLINE
;<0125> CONTINUE1:
CMP     AL,3A            ; is it a ':' ?
JNZ     012C            ; no --> CONTINUE2
INC     SI               ; skip the ':'
JMP     016E             ; --> OUTPUTLINE
;<012C> CONTINUE2:
CMP     AL,43            ; is it a 'C' ?
JNZ     0135            ; no --> CONTINUE3
ADD     SI,09            ; skip 'CX XXXX',CR,LF
JMP     0118             ; --> NEWLINE
;<0135> CONTINUE3:
CMP     AL,57            ; is it a 'W' ?
JNZ     013E            ; no --> CONTINUE4
ADD     SI,14            ; skip 'Writing XXXX bytes',CR,LF
JMP     0118             ; --> NEWLINE
;<013E> CONTINUE4:
CMP     BYTE PTR [SI+04],3A ; line begins with address ? (XXXX:YYYY)
JNZ     016B            ; no --> CONTINUE5
CMP     BYTE PTR [SI+0A],3B ; does a comment follow ? (XXXX:YYYY ; )
JNZ     016B            ; no --> CONTINUE5
CMP     BYTE PTR [SI+0B],3C ; does comment contain address ? (XXXX:YYYY ; <)
JZ      015F            ; yes --> CHANGEADDRESS
MOV     WORD PTR [SI+03],3C3B ; write '<' before 'YYYY'
MOV     WORD PTR [SI+09],203E ; write '>' after 'YYYY'
ADD     SI,03            ; skip 'xxx'
JMP     016E             ; --> OUTPUTLINE
;<015F> CHANGEADDRESS:
MOV     AX,[SI+05]       ; replace address in comment
MOV     [SI+0C],AX
MOV     AX,[SI+07]
MOV     [SI+0E],AX
;<016B> CONTINUE5:
ADD     SI,0A            ; skip 'XXXX:YYYY '
;<016E> OUTPUTLINE:
CLD
LODSB                    ; read character and increment SI
MOV     DL,AL
CMP     DL,0D            ; is it a CR ?
JNZ     017C            ; no --> CONTINUE6
CMP     [SI],DL          ; a second CR follows ?
JNZ     017C            ; no --> CONTINUE6
INC     SI               ; skip it
;<017C> CONTINUE6:
MOV     AH,02            ; output character
INT     21
CMP     DL,0A            ; was it a LF ?
JNZ     016E            ; no --> OUTPUTLINE
JMP     0118             ; yes --> NEWLINE
;<0187> BUFFER:

RCX
87
W
Q
```

Figure 1: Redirect this script file into DEBUG to create DEB2SCR.COM, a very handy utility that calculates jump addresses in DEBUG scripts, making it quicker and easier to program .COM files in DEBUG.

User-to-User



This utility is a real boon to anyone who programs .COM files in DEBUG. There are a couple of points in the instructions that may not be perfectly clear, though. Besides putting labels at the jump destinations, add a comment consisting of the label name to the jump instructions themselves, like this:

```
JNZ 123 ;LABEL1
```

Also, you have to come fairly close with the numbers you guess, because the conditional jump instructions are limited to a range of -128 to 127 bytes from the current location. If the output from DEB2SCR contains a DEBUG error message under a conditional jump, adjust the number and try again.

As the letter states, the number at the END label determines the length of the code. However, the actual length is the END address minus 100h. DEBUG can help you with hexadecimal arithmetic. Just type H followed by the END address

and the number 100, for example

```
H 0187 100
```

DEBUG will return two numbers that represent the sum and difference of the two arguments. Take the second number and copy it on the line after RCX.

Redirecting
DEB2SCR.COM's
output to overwrite
the original file could
trash your script file.

The authors recommend that you redirect the output of DEB2SCR.COM so that it overwrites the original file. But this is dangerous and could conceivably trash your script file. For example, if you accidentally inserted a blank line before the

end of your block of assembler instructions, DEBUG would consider every line thereafter to be an error. And DEB2SCR itself sometimes appends a couple of lines of garbage characters to the end of the file. For safety, run the program with this command instead:

```
DEBUG < SAMPLE.SCR | DEB2SCR >
```

```
SAMPLE.NEW
```

Of course you'll replace SAMPLE.SCR and SAMPLE.NEW with your own files.

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Neil J. Rubenking is the author of a new book, *PC Magazine Turbo Pascal Techniques and Utilities*, published by Ziff-Davis Press (ISBN 1-56276-010-6).—Ed.

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edited by
Trudy Neuhaus

Languages

AVOID VIDEO JITTERS

I've noticed that whenever I switch video modes in my QuickBASIC programs, the screen jitters and seems to "convulse" for a half-second or so. To avoid this problem, just before issuing the SCREEN statement, I use one of the two methods shown in Figure 1. Although they both clear the screen to black-on-black, the first method is suitable if text mode is currently active, while the other should be used when you're working in graphics mode. This technique has proven quite effective, but I would really like to know what caused the problem in the first place.

Bill Fitzpatrick
Veneta, Oregon

PC Whenever you change video modes in a program, the horizontal scan rate is altered, based on the number of pixels across that are to be displayed on the screen. The majority of multiscanning monitors require a brief



will shrink and then swell. It may overshoot, too, depending on the monitor design. The solution presented by Fitzpatrick is a good one because it at least hides the unsightly mess that is unavoidable.—Ethan Winer

TWO WAYS TO HIDE SCREEN JITTERS

```
COLOR 0, 0: CLS
LINE (0, 0)-(600,350), 0, BP
S1 = TIMER
WHILE S1 + .75 > TIMER: WEND
```

'use this version in text mode
'and use this in EGA SCREEN mode 9

'in either case, pause for 3/4 second

Figure 1: Incorporate these methods in your QuickBASIC programs to avoid display jitters when changing video modes.

amount of time to adjust to the new scan rate; in some cases, this can even be as long as a second or two.

Another reason for video jitters is that the loss of the synchronizing signal stops voltage from traveling to the yoke, which in turn causes the electron beam to stop sweeping. The result is that the screen collapses to a tiny dot in the center. Because the yoke is a magnetic device, it has some inertia. So an interruption in the signal driving it will cause a change in image size—a quick (but not instant) collapse of the image. If the sync signal is only temporarily interrupted, the image

CREATING A RANDOM SET

Some time ago, you ran an item on randomizing ordered sets (Languages, November 28, 1989). While there is no denying that the method described works, and the code is an interesting tutorial on the **qsort** routine, there is a much shorter and quicker way to shuffle a deck of cards. The program SHUFFLE.PAS (shown in Figure 2) demonstrates it.

I don't know where this method comes from—it's part of the folklore of programming. Knuth refers to it in one of his books. I first saw it used in a FORTRAN program over 20 years ago and expect it was old

then. This deceptively simple method has been validated with all manner of statistical tests.

The idea is to pass just once through the initially ordered array and to swap each element with one chosen at random. This is slightly more subtle than it sounds, as the element being swapped may already have been swapped from somewhere else earlier in the process. Some elements may be swapped many times; some only once. To illustrate, the program shows how to shuffle an array of integers (the actual shuffling is independent of the type of the array elements).

This little routine can be used in all kinds of situations. As one example, to choose 16 weeks of a year randomly, simply shuffle the numbers 1 to 52 and choose the first 16. Unlike just choosing 16 random numbers, this way cannot choose the same week twice.

Gordon Findlay
Christchurch, New Zealand



The algorithm in SHUFFLE.PAS is indeed part of the folklore of programming, but it has two problems. The first is major: It omits half of the possible ways a deck of cards could be shuffled. The second is minor: After correcting for the first problem, the algorithm still doesn't yield all orderings of the deck with equal frequency.

To see the first problem in action, consider running the SHUFFLE.PAS algorithm on a deck with only two cards. It isn't allowed to swap any card with itself, so it *must* swap the first card with the second. Then it *must* swap the second card with the first. The only possible outcome is an arrangement that's unchanged. Half the time it *should* yield the reverse arrangement, but it can't.

Now consider a three-card deck. For each of the three cards, you must choose to swap with one of the other two. Three two-way choices means there are eight equally likely outcomes. Right away we know that all of the orderings of three

Languages

SHUFFLE.PAS

COMPLETE LISTING



```
PROGRAM demonstrate_shuffling;
VAR
  deck      : ARRAY[1..52] OF Integer; {or of anything else}
  saved, i, j : 1..52;

BEGIN
  {place initial values in array}
  FOR i := 1 TO 52 DO
    deck[i] := i;

  {seed random number generator}
  Randomize;

  {here's the guts of it}

  {shuffle the array - pass *once* through the array, swapping each element
  with another, randomly chosen, element}

  FOR i := 1 TO 52 DO
    BEGIN
      {find another element to swap with. Random returns value between
      0 and 51, so must add 1}
      j := Random(52)+1;
      {make sure not swap element with itself}
      WHILE j = i DO
        j := Random(52)+1;
      {perform the swap}
      saved := deck[i];
      deck[i] := deck[j];
      deck[j] := saved;
    END;

  {output for testing purposes}
  FOR i := 1 TO 52 DO
    BEGIN
      Write(deck[i]:3);
      IF i MOD 10 = 0 THEN WriteLn;
    END;
  WriteLn;

END.
```

Figure 2: SHUFFLE.PAS produces a randomly ordered set, but it has two problems.

SHUFFLE2.PAS

COMPLETE LISTING



```
PROGRAM demonstrate_shuffling;
VAR
  deck      : ARRAY[1..52] OF Integer; {or of anything else}
  saved, i, j : 1..52;

BEGIN
  {place initial values in array}
  FOR i := 1 TO 52 DO
    deck[i] := i;

  {seed random number generator}
  Randomize;

  {here's the guts of it}

  {shuffle the array - pass *once* through the array, swapping each element
  with another, randomly chosen, element}

  FOR i := 52 DOWNTO 2 DO
    BEGIN
      {swap element in ith place with any
      element at or below that place}
      j := Random(i)+1;
      saved := deck[i];
      deck[i] := deck[j];
      deck[j] := saved;
    END;

  {output for testing purposes}
  FOR i := 1 TO 52 DO
    BEGIN
      Write(deck[i]:3);
      IF i MOD 10 = 0 THEN WriteLn;
    END;
  WriteLn;

END.
```

Figure 3: SHUFFLE2.PAS quickly shuffles an array of integers into random order.

cards don't occur in equal amounts—there are six possible orderings and eight results of the shuffle. But it's worse than that; again the SHUFFLE algorithm produces only half of the possible orderings. Starting with 1 2 3, two of the eight possible paths produce 3 2 1, three produce 2 1 3, and three produce 1 3 2. None of them result in 1 2 3, 2 3 1, or 3 1 2.

The source of the problem is the line that prevents the algorithm from swapping a card with itself. If you remove that line, you get all of the possible orderings in the results. And they appear with almost the same frequency.

Almost? Yes, even if you correct the big problem, there's still a subtle problem with the algorithm. The number of ways to arrange n items in order is $n!$ (n factorial). The modified SHUFFLE algorithm has n possible choices for swapping each of n cards, so it has n^n possible paths to the final ordering. For any n greater than 2, n^n is not evenly divisible by $n!$. Hence it's not possible that every one of the $n!$ orderings occurs with equal likelihood.

So what can you do? A very minor change will make the shuffling algorithm more nearly perfect. Picture this method of shuffling the cards: Choose one card at random, remove it from the deck, and place it on a new pile. Choose another from the remaining cards and place it on top of the first. Continue doing this until the original pile is gone. This method produces all of the possible orderings with equal likelihood.

We don't actually need a second pile, though—it can occupy the same array as the old pile. Let's say we want to pick a card for "slot" number 52. We choose any of the 52 cards and swap it with the card at 52. To pick a card for slot 51, we choose any card at or below 51 and swap it into slot 51. In each case, we choose a new card at random from those cards that have not yet been swapped. SHUFFLE2.PAS in Figure 3 demonstrates this process. The apparent difference is slight, but we want perfection!—Neil J. Rubenking

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by
Jeff Proise

Tutor

CURRENT DIRECTORY STRUCTURES

If you change from drive C: to drive D: and then back to drive C:, DOS remembers the directory you were in on C: and drops you back into it. How does it remember where you've been?

Frank Guzewicz
Dallas, Texas

PC For each logical drive defined in the system, DOS maintains a data structure called a *current directory structure*, or CDS. Inside the CDS, DOS stores the name of the current directory; a pointer to the drive's *drive parameter block*, or DPB (another structure that holds physical information about the drive, such as the number of sectors per cluster and the media descriptor byte); and other information unique to each drive in the system. When you switch drives, DOS consults the CDS for the new drive to determine what the current directory is. The CDS first appeared in DOS 3.0; before that, the name of the current directory was part of the DPB itself.

The number of CDS structures DOS sets up is determined by the LASTDRIVE statement in CONFIG.SYS. If LASTDRIVE=Z, for example, DOS creates 26 of them. If there is no LASTDRIVE statement, DOS defaults to LASTDRIVE=E and reserves room in low memory for five CDS structures.

The format of a CDS is shown in Figure 1. We don't know what all the fields in it are used for, because the CDS has never been documented in official technical references. What we do know about the structure of the CDS comes mostly from texts like *Undocumented DOS*, (edited by Andrew Schulman, Addison-Wesley, 1991) which documents in an unofficial way many of the formerly undocumented internals of DOS.

The first field in the CDS contains an ASCIIZ record of the current directory for the drive. For a nonnetwork drive, the first three characters of this field are a

■ CURRENT DIRECTORY STRUCTURES: How DOS remembers where you are.

drive letter, a colon, and a backslash.

If access to the drive has been redirected with a SUBST command, the pathname that's stored in the CDS is the true path to the directory, not the fictitious path created by SUBST. For example, if you define a logical drive F: and link it to the \WP\DOC directory of drive C: with the command **SUBST F: C:\WP\DOC**, the current directory for drive F: in the CDS would begin with C:\WP\DOC, not F:\. Similarly, if the JOIN command is used, to make it appear that one drive is the subdirectory of another drive, the record of the current directory in the CDS will contain the name of the drive and di-

rectory to which the drive was JOINed.

The word at offset 43h in the CDS contains a series of four bit flags that DOS uses to record information about the type of drive the CDS corresponds to (network or local) and whether the drive is currently JOINed or SUBSTed. Bit 15 is set to 1 if it's a network drive; bit 14 is set if it's a local drive (a physical drive, a logical drive, or a RAM drive); bit 13 is set if a JOIN command is in effect for the drive; and bit 12 is set if a SUBST command is in effect. If no logical drive exists for this CDS, then bits 15 and 14 are set to 0.

The CDS contains the segment:offset address of the associated DPB at offset 45h. This links the logical drive described in the CDS to the physical drive described in the DPB. The word at offset 49h contains the starting cluster number for the drive's current directory. This enables DOS to access that directory and its descendants more quickly by eliminating the need for it to search the FAT each time a file or subdirectory in the current direc-



FORMAT OF THE CURRENT DIRECTORY STRUCTURE

OFFSET	SIZE	DESCRIPTION
00h	67 bytes	Current directory (ASCIIZ format)
43h	Word	CDS bit flags Bit 15: 1=network drive Bit 14: 1=local drive Bit 13: 1=drive is JOINed Bit 12: 1=drive is SUBSTed
45h	Double word	Pointer to drive parameter block (DPB) for this drive
49h	Word	If local drive: starting cluster of the current directory; If network drive: offset address of a network redirector record
4Bh	Word	If local drive: unknown; If network drive: segment address of a network redirector record
4Dh	Word	Unknown
4Fh	Word	Offset within the current directory field to the location where the root directory of this drive begins
DOS 4.0 AND 5.0 ONLY		
51h	Byte	Unknown
52h	Double word	Pointer to installable file system (IFS) driver (0=DOS file system)
56h	Word	Unknown

Figure 1: For each logical drive defined in a system, DOS maintains a data structure, which stores the name of the current directory and other information unique to each drive.

ANNOUNCING

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*Bob Hayes/Nordstrom, Inc.
Technology Architecture Manager*

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FAX modems are rather commonplace and, up to now, they've had a common problem: commit to a FAX modem manufacturer and you're also committed to his choice of FAX software. The software lacks some features you'd really like to have? Tough. You're committed.

UDS has solved that problem with the new FasTalk FAX32 — it combines a V.32/42 *bis* modem with an EIA Class I, Group III 9600 bps FAX in a single standalone package. It comes with a fully featured Class I software package, or you may select from a growing range of other commercially available programs. You wind up with the FAX/software combination that's best suited for your communication needs.

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Specify the new FAX32. For technical details and prices, contact UDS at 800/451-2369 (in Alabama, 205/430-8000); FAX 205/430-8926.

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by
Frank J. Derfler, Jr.

Connectivity

SPEEDING UP A TOPS NETWORK

The seven PCs in our office are linked with four-wire telephone cable and use TOPS FlashTalk network adapters and the TOPS/DOS, Version 3.0, software. Right now we use the network only to transfer files and to print directly to the AppleTalk card in our NEC 890 Silentwriter printer, but we'd eventually like to use it for other LAN functions such as sharing modems.

We've run into two problems, though. The first is that the TOPS adapters won't work in our new 386/33 PC without downshifting, that is, running the CPU at a slower speed. The second is that TOPS is not *Microsoft Windows*-compatible. We'd like to retain the PC-to-Macintosh capability of TOPS for future compatibility. But how do we get things to work now?

Greg Chittick
Santa Barbara, California

PC I checked with the folks at Sitka Corp., as TOPS Inc. is now known, to get their best advice. The Sitka TOPS networking scheme is distinguished by its ability to connect a variety of computers running under different operating systems, and many users want to be able to run it on high-speed 386 machines. The company plans to announce an upgrade to the FlashCard that should help, but it won't be available until the end of 1991. In the meantime though, you can run *DOSTOPS* over Ethernet adapters from 3Com and Western Digital.

Sitka is working on a special release for *Windows*, but printing functions and client capabilities are currently available. For details, call Sitka at 415-769-8711.

SAFETY SOLUTIONS FOR LANTASTIC

In your article on UPS systems in the November 27, 1990, issue of *PC Magazine* ("Building Workgroup Solutions: LAN Server UPSs"), you indicate that there are no UPS interfaces for DOS-based LAN operating systems. Is there any type of

- **SPEEDING UP A TOPS NETWORK:** Slow FlashCards falter in fast machines.
- **SAFETY SOLUTIONS FOR LANTASTIC:** *LANTastic* 4.0 has full capabilities for UPS support and backups.
- **WIRELESS CONNECTIONS:** Bridging the LAN gap with light.
- **EFFICIENT NETWORK PRINTING:** Good print server software makes network-capable printers even better.
- **SHARING A FAX:** Here's a product that lets up to eight users send faxes on a network.
- **SERVERJET UPDATE:** Now even more users can share a LaserJet.

interface that will bring about a smooth shutdown on a *LANTastic* network?

The dealer who sold us the network recommended a tape backup system. I'd like to use a removable hard disk instead so that we could promptly switch to the removable disk if our hard disk crashes. Do you think this is a good idea? Will it work with *LANTastic*?

Joseph S. Basloe
Herkimer, New York

PC Release 4.0 of *LANTastic* includes a utility for communicating with a UPS through the serial port of any PC acting as a server. When it receives a

signal from the UPS, the software can notify users that the server is running on the UPS batteries, then log out the users and shut down the server. Finally, it can send a message to the UPS telling it to shut down to conserve batteries. These actions are all programmable, and you can set them up in a timed sequence to match the capacity of the UPS.

Using a removable drive for backup is a fine idea if you can afford it. Certainly, *LANTastic* can back up to any drive recognized by DOS. But you have more to worry about than a hard disk crash. One of the things you want to be able to do with a backup is to remove the backup copy to a safe location for storage so that you still have a reserve in the event of a fire or other disaster at the primary operating location. Many companies maintain 5 to 7 back-up tapes that they rotate to a storage location outside of the main office on a daily basis. Can you afford the removable drives you need for a good rotating safety storage program? I suggest you consider removable Bernoulli cartridges as an alternative. They're much more economical than removable hard disk drives, work very well with *LANTastic*, and can act as hard disk drives in the event of mechanical failure of the main drive.

WIRELESS CONNECTIONS

We're planning to move into a new office in a neighboring building, but we can't figure out how to install wiring to link my desktop computer in the new building with the AppleTalk network in the old building—even though I can see the old office from the new one. Can we use any of the new wireless LANs on AppleTalk to connect across the approximately 25 feet separating the two facilities?

Delmonte Campbell
Cleveland, Ohio

PC NCR's WaveLAN will only connect you if you're running *NetWare* over Ethernet cabling. Motorola's Altair will link nodes using any

Connectivity

LAN operating system, but again, only over Ethernet cabling. But here's one possibility. Photonics of Campbell, California, offers a wireless LAN option that will interface with AppleTalk. Its Photolink transceivers use reflected infrared light to transmit signals, instead of the radio waves that carry the mail for WaveLAN and Altair.

The original Photolink units were designed to work *within* an office. The newer Building-to-Building Photolink will connect computers in adjacent buildings. Units are attached to the inside of a window or to a wall near a window and aimed through the glass directly at a unit in another building. These units are specially tuned to operate in the direct sunlight that could interfere with window-to-window operation.

Building-to-Building Photolink sells for \$3,990 for a pair of transceivers. They are very simple to install and can carry signals over line-of-sight distances up to 600 feet. The product is currently avail-

able only for AppleTalk/LocalTalk networks, but an Ethernet version is due early in 1992 and Token-Ring sometime afterward. Contact Photonics at 800-628-3033 for details.

Print-server software helps you get the best possible throughput from the new network-capable printers.

EFFICIENT NETWORK PRINTING

We received a trial copy of *LANSpool Si* with our HP LaserJet IIISi printer. I don't understand why we need it and I hesitate to load it into the server. The print server program in *NetWare* seems to work fine with the LaserJet IIISi.

Neal Balcomb
Boston, Massachusetts



The networkability of the LaserJet IIISi lets it grab print jobs quickly from the network, but if you're going to get the best possible throughput from the new network-capable printers, you've also got to move jobs efficiently *from* the PC acting as print server. This is where print-server software comes in.

Novell optimized its Pserver program to some degree, alleviating a portion of the problem, but *LANSpool Si* is designed to address the HP LaserJet IIISi directly. If you don't send a heavy stream of jobs to the printer, you might not see the difference, but under heavy loads *LANSpool Si* thus moves jobs to the LaserJet IIISi (and therefore paper out of the printer!) many times faster than Novell's Pserver.

LANSpool Si sells for \$395 per printer, so you'll only want to buy it if you have heavy printing needs, but then, that's the definition of most people who buy the LaserJet IIISi.

LANSpool Si runs on both *NetWare* 286 and *NetWare* 386 as either a value-added process (VAP) or a *NetWare* Loadable Module (NLM). The company has an excellent reputation, and I would not

Oh, what a twis

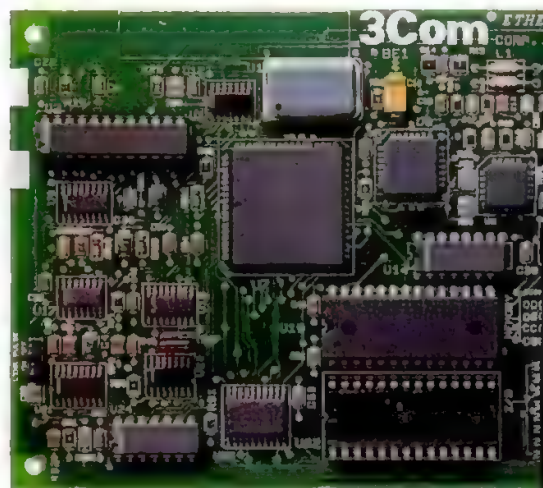
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Connectivity

hesitate to load its software on a production server. If you would like more information, contact LANSystems at 800-235-3374.

SHARING A FAX

I would like to give each of the users on our *LANtastic* network the ability to send faxes, but I don't want to buy a fax board for each of them. So far the products that I have seen that let you share fax-sending capabilities on a LAN seem too expensive for my five-user network, and I'm not even sure they'll work under *LANtastic*. Can you recommend a fax system we can share?

Charlotte Lawrence
Reston, Virginia



Artisoft (the maker of *LANtastic*) and Novell have both certified the EZ-FaxLAN from Calculus. An eight-user version sells for the very reasonable price of \$499, while the unlimited-user version costs \$899. And there is

an additional savings—the computer acting as a fax server does not have to be dedicated to the task. It can also be used as someone's PC, although the effects of the fax activity on any application programs running will depend on factors like the power of the processor and how much fax activity takes place. For more information, contact Calculus Corp. at 408-733-7800.

SERVERJET UPDATE

In the January 15, 1991, issue of *PC Magazine*, you discussed the SimplAN ServerJet, a product that fits inside an HP LaserJet and allows the printer to simultaneously connect to as many as ten PCs. You did provide the telephone number for ASP Computer Products, but many of us outside the United States would appreciate the company's address as well.

D. Yellowlees
Townesville, Queensland
Australia



As I noted in the January 15 column, the SimplAN ServerJet is my favorite solution for sharing a LaserJet printer among several users, with-

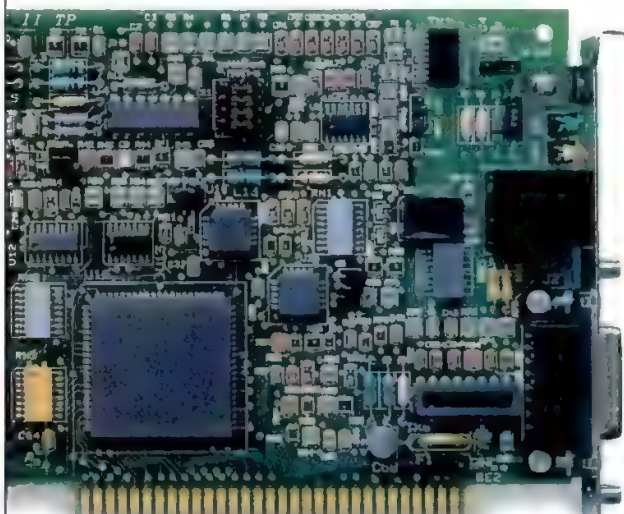
out resorting to a full media-shared network. And now the ServerJet can connect a LaserJet II, IID, III, or IIID to as many as 12 computers at once. In the U.S., the products range in price from \$395 for a 4-port model to \$895 for the 12-port version. Note, however, that prices might be higher if you want to add optional memory. ASP Computer Products is located at 1026 W. Maude Ave., # 305, Sunnyvale, CA 94086.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tips we print. Please submit your letter on a disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named PC MAGAZINE LAN LABS). We are unable to answer letters individually.

Frank J. Derfler, Jr., is the author of a new book, The PC Magazine Guide to Connectivity, published by Ziff-Davis Press (ISBN 1-56276-001-7).—Ed. ■

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Of course, EtherLink 10BASE-T adapters are compatible with your hardware. And you can use them with virtually all software on your network. For IBM PC, XT, or AT there's EtherLink II® TP. For Micro Channel PS/2 models there's EtherLink/MC TP.

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CIRCLE 293 ON READER SERVICE CARD

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Reputable computer dealers will answer all of these questions to your satisfaction. Don't settle for less when buying your computer hardware, software, peripherals and supplies.



Purchasing Guidelines

- *State as completely and accurately as you can what merchandise you want including brand name, model number, catalog number.*
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- *Confirm that the price is as advertised.*
- *Obtain an order number and identification of the sales representative.*
- *Make a record of your order, noting exact price including shipping, date of order, promised shipping date and order number.*

If you ever have a problem, remember to deal first with the seller. If you cannot resolve the problem, write to MAIL ORDER ACTION LINE, c/o DMA, 6 E. 43rd St., New York, NY 10017.

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FastData 386 Systems



FastData 386/33 \$1999

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Standard Features

- ✓ 33mhz Intel 386-DX processor.
- ✓ 64K high-speed memory cache.
- ✓ 4 megabytes high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Full size (shown) or standard size chassis with keylock and reset buttons.
- ✓ 387-DX coprocessor socket.
- ✓ 230 watt power supply.
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 1mb Video Ram.
- ✓ Clock calendar, parallel port, game port and two serial ports.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion & 5 drive bays.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ DOS 4.01 or 5.0.
- ✓ Windows & Mouse add \$79.
- ✓ FCC Class B approved.

386/33	80mb	100mb	200mb	660mb
Mono	\$1,699	\$1,789	\$2,049	\$3,469
VGA White	\$1,799	\$1,889	\$2,149	\$3,569
VGA Color	\$1,949	\$2,039	\$2,299	\$3,719
VGA 1024	\$1,999	\$2,089	\$2,349	\$3,769



FastData 386/25 \$1799

The optimum combination of features, expandability, and power make the FastData 386/25 an ideal choice for those whose applications demand high speed 32 bit processing and expandability. The value of the 386/25 goes far beyond its price; it comes configured with a full four megabytes of fast RAM, a quick 20 millisecond 80 megabyte hard disk, and maximum VGA displaying 1024 by 768 resolution powered by a high-output 16 bit 1mb VGA board. Also, the FastMicro team will configure your FastData 386 exactly the way you want, without sending you shopping elsewhere.

Standard Features

- ✓ 25mhz Intel 80386-DX.
- ✓ 4 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis or mini-tower (shown) with keylock, speed and reset buttons.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply.
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 slots & 5 drive bays.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ DOS 4.01 or 5.0.
- ✓ Windows & Mouse add \$79.
- ✓ FCC Class B approved.

386/25	40mb	80mb	100mb	200mb
Mono	\$1,369	\$1,499	\$1,589	\$1,849
VGA White	\$1,469	\$1,599	\$1,689	\$1,949
VGA Color	\$1,619	\$1,749	\$1,839	\$2,099
VGA 1024	\$1,669	\$1,799	\$1,889	\$2,149



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\$1599 FastData SX/20

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Standard Features

- ✓ 20mhz Intel 80386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ MS-DOS 4.01 or 5.0.
- ✓ FCC Class B approved.

SX/20	40mb	80mb	100mb	200mb
Mono	\$1,169	\$1,299	\$1,389	\$1,649
VGA White	\$1,269	\$1,399	\$1,489	\$1,749
VGA Color	\$1,419	\$1,549	\$1,639	\$1,899
VGA 1024	\$1,469	\$1,599	\$1,689	\$1,949



\$1399 FastData 386/SX

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and also want to run their favorite DOS applications at surprising speeds. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit super VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis with keylock, speed and reset buttons (mini desktop shown - add \$50).
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ MS-DOS 4.01 or 5.0.
- ✓ FCC Class B approved.

386/SX	40mb	80mb	100mb	200mb
Mono	\$1,099	\$1,229	\$1,319	\$1,579
VGA White	\$1,199	\$1,329	\$1,419	\$1,679
VGA Color	\$1,349	\$1,479	\$1,569	\$1,829
VGA 1024	\$1,399	\$1,529	\$1,619	\$1,879

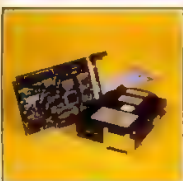
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Seagate 89mb AT Kit \$349

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89MB ST1102A 19ms IDE Drive	299
125MB ST1144A 19ms IDE Drive	399
210MB ST1239A 15ms IDE Drive	599
330MB ST2383E 16ms ESDI Drive	1199
Sun Moon Star Ext. CD-ROM Drive Kit	499
Tasc	
1.2MB 5.25" Floppy	65
1.44MB 3.5" Floppy	65



Toshiba 100mb IDE Kit \$439

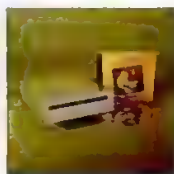
Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20ms 105mb drive and built-in 1.1 controller, 16 bit IDE card with dual floppy controller and cables, 5.25" brackets and rails.

Toshiba

360K 5.25" Floppy (Black)	59
1.2MB 5.25" Floppy	59
1.44MB 3.5" Floppy	69
65mb MK134 22ms RLL drive	279
100mb MK234FCH IDE 3.5" drive	399
Western Digital	
WD93044 40mb IDE 28ms	199
WDAC280 80mb IDE 20ms	299
WDAP4200 200mb IDE 20ms	649
WE1007V-SE2 ESDI AT 1:1 dual controller	149

Sony CD-ROM Drive \$379

Affordable CD-ROM technology is here! This player reads over 600mb from just one CD and can even play your favorite audio CDs. This internal unit works in 286 thru 486 PC's regardless of hard drive type and comes with cable & interface. Add an Encyclopedia, Book of Mammals or game CD for \$49 each.



BOARDS

Artisoft/Lantastic

Lantastic 2mbps Starter Kit - Two Station	349
Lantastic 2mbps Adaptor	139
Lantastic Ethernet Starter Kit - Two Station	469
Lantastic Ethernet Adaptor	209

ATI

2400 ETC Internal/External	129 / 159
8514/Ultra-VGA 1mb	599
9600/E External MNP V.42bis	369
VGA Basic 16	75



Sound Blaster \$149

Sound Blaster does for sound what VGA does for graphics. Supported by the largest software library, Sound Blaster makes your games come to life. Also includes a music synthesizer, voice input and sound compression and MIDI interface. SB Talker even converts text into spoken English. Includes a game port also.

VGA Wonder + 256K 512K	159 / 189
VGA Wonder XL 256K / 1mb	189 / 269
Brown Wagh Sound Blaster	149

Everex

2400B Int. Modem	69
EGA 480 Card	49
RAM3000 16 bit - w/ OK, add \$60 mb max 3mb	75
RAM8000 16 bit - w/ OK, add \$60/mb max 8mb	169

Hayes

JT FAX 4800B Internal	139
Personal Modem 2400 w/Prodigy	119

Hercules Graphic Card +

Intel	
Classic 2400 Modem Int. / Ext.	139 / 169
Satisfaction Classic - Internal 9600	379
287XL	85
387-DX25 or 33	209
387-SX16 / 20	129 / 139

Logitech

ScanMan Plus	149
ScanMan 256	279

Orchid

ProDesigner II 512/1mb	279/329
Tiny Turbo 286	207
Tiny Turbo Xtra	269

Practical Peripherals

PM9600SA \$449

This external modem features V.42 and MNP error correction combined with MNP5 and V.42 bis data compression to provide total high speed throughput. The PM9600SA is also V.32 TCM, V.32, V.22 compliant and comes with a five year guarantee.

Paradise

Basic VGA - 8 bit	99
VGA 1024 256K/512K	149 / 179

Practical Peripherals

2400B Int. Modem	125
2400B Int. with MNP	159
PM9600SA Ext. V.32/V.42bis	449

USRobotics

2400 Sportster Int. / Ext.	119 / 135
2400 Sportster MNP Int. / Ext.	159 / 189
Couner HST 14,400 Int. / Ext.	539 / 579
Couner HST 14,400 Dual Standard Ext.	839

Video 7

VGA 1024i 256K / 512K	159 / 189
V-RAM II VGA 512K	339

ZOOM

HC2400 Internal	69
2400 V.42bis External Modem	119
9624 Send/Receive Internal Fax Modem	159



MONITORS

Mitsubishi	
1410 EGA	325
Diamond Scan 1381	499
NEC	
Multisync 2a	469
Multisync GS 2a	199
Multisync 3d	629
Multisync 4d	949
Panasonic C1381 VGA	399
Seiko CM1440 / 1450	499 / 639
Sony 1304 Multiscan	669
Zenith 1492	599

FastData Products

FastData 16 Bit VGA

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.

256K	\$79
512K	\$99



FastData 16bit 1mb VGA	119
FastData CGA Card	35
FastData MGP Card	29
FastData Parallel/Dual Serial/Game Card	29



FastData 2400 Baud Internal Modem

The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with communications software.

9600B Send/Fax w/ 2400B Modem	99
9600B Send/Receive Fax w/2400B	119
MFM 16 Bit 1:1 Hard/Floppy Disk Cont.	59
RLL 16bit 1:1 Hard/Floppy Disk Cont.	59
XT 1.44 Dual Floppy Controller	35

FastData Monitors

Your best value, guaranteed! We have a full line manufactured for us by manufacturers like Hyundai and Matsushita (Panasonic). As with all FastData branded product, you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.



FastData Monitors

14" Amber or White Monochrome	99
14" White VGA Monochrome	119
14" CGA Color 52 dot pitch	199
14" VGA Color 31 dot pitch	279
14" Super VGA 1024 x 768 .28 dp	319
14" Non-Int. VGA 1024 x 768 .28 dp	429

PRINTERS

Canon BJ10E	319
BJ300 / BJ330	459 / 599
Citizen	
200GX	159
GSX140 / GSX145	279 / 379
PN48 Notebook Printer	299
Fujitsu DL3400	359



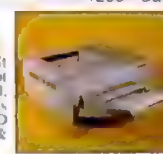
Citizen GSX-140 \$285

Loaded with features, this 24 pin printer is a hot seller! It comes with 6 resident fonts, paper parking, and Epson & IBM printing modes. It does up to 192 CPS and has a unique LCD control panel that lets you set everything without DIP switches. Upgrade to color anytime for just \$39.

NEC	
P3200	269
P3300	369
P6200 / 6300	469 / 629
OKIDATA Okilaser 400	669
Panasonic	
KXP1180	155
KXP1123	239
KXP1124	299
KXP1624	379
KXP4420 Laser	829
KXP4450i / 4455 Lasers	1299 / Call

NEC Silentwriter 2 Model 90 \$1595

PC Magazine's editor's choice! It comes with 2mb of memory, Postscript by Adobe with 35 fonts, and parallel, serial and AppleTalk interfaces. All this and 6 ppm speed, an easy-to-use LCD operator panel and letter, legal, & envelope feed.



Seiko Smart Label Printer Plus	167
Star	
NX1001	149
NX1500	299
NX2410 / 2415	239 / 369
NX2410 / 2415	419 / 539
Texas Instruments Microlaser PS17	1199
Microlaser PS35	1499

FastData 286/12 \$749

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Keytronic keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$59)
- ✓ Standard chassis
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports.
- ✓ Keytronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ MS-DOS 4.01 or 5.0.
- ✓ Full documentation.
- ✓ FCC Class B approved.



	40 113E	80 113E	100 113E	200 113E
286/12				
Mono	\$599	\$699	\$799	\$899
VGA White	\$699	\$799	\$899	\$999
VGA Color	\$799	\$899	\$999	\$1,099
VGA 1024	\$1,099	\$1,299	\$1,499	\$1,699

DATABASE & FORMS

askSam 5.0	209
Avery List & Mail Plus	37
Clarion Personal Developer	45
Clarion Professional Developer	449
Clipper 5.0	489
DataEase	459
dBase III+	439
dBase IV	479
dBXL Diamond	129
Formbase	299
FormTool Gold	52
Formfiller	85
Foxbase Plus	179
FoxPro	419
Paradox 3.5	489
Per:Form Designer & Filler	89
Personal Rbase	79
Q & A	214
RapidFile	99
Rbase for DOS	447
Reflex	159

GeoWorks Ensemble \$115

GeoWorks is the entry-level graphical environment that's received rave reviews. Includes GeoWrite word processor & desktop publisher, GeoDraw object-oriented drawing package, and GeoComm communications package. Also comes with GeoManager, GeoPlanner and GeoDev applications. Plus all programs operate with the same point & click simplicity (mouse required).



DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	299
Adobe TypeSet 1 or 2	57
db Publisher Professional	389
Express Publisher	Call
Pagemaker 4.0	489
PFS-First Publisher	89

Pagemaker 4.0 \$489
The top desktop publishing software for Windows just got better. Version 4.0 adds a story editor, a built-in word processor and spell checker. Pagemaker's advanced text manipulation and color design tools gives your publications a professional look. New Table Editor lets you create dynamically linked tables and graphics can flow automatically with text. Also includes Adobe Type Manager for Windows as a bonus.

PrintShop	33
Publisher's Pantbrush	149
Publish It!	129
Ventura Publisher Gold / Windows	519

FINANCIAL

ACCPAC BPI Value Pak	359
ACCPAC Simply Acctg for Windows	119
Bedford Integrated Acct	119
DAC Accounting 4.1	79
DAC Bonus Pack 4.1	119

Crystal Accounting \$175

Peachtree brings integrated accounting to Windows. Crystal Accounting takes advantage of Windows ease and multitasking power. It includes General Ledger, Accounts Payable, Accounts Receivable, Inventory, and Payroll. Its financial report writer lets you generate customized financial statements and reports and its data exchange feature lets it data work with other Windows applications.

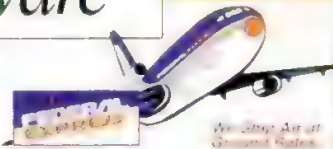
Dollars & Sense	55
Managing Your Money	125
Money Matters	49
One Write Plus G/L, A/P & A/R	165
Pacioli 2000	35
Peachtree Complete III	139
Peachtree with Data Query	209
Quicken	36
The Manager's Organizer	139
Timeslips III	179
Wealth Builder	95

GRAPHICS

3-D Charts to Go for Windows	95
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Corel Draw 2.0	359
Design CADD 3-D	185
DrawPerfect	259
Freelance Graphics 4.0	299
Generic 3D Drafting	199
Generic Cadd Level 2 Starter Kit	89
Generic Cadd 5.0	279
Harvard Graphics	299
PC Paintbrush IV Plus	109
Perspective Jr	69
PFS-First Graphics	89

Freelance Graphics for DOS \$299

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First Choice	95
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89

MICE/INPUT

Keytronics KB101 Keyboard	59
Keytronics Professional Mouse	59
Logitech Mouseman Serial righthand	65
Logitech Mouseman Serial w/Windows 127	65
Logitech Mouseman Bus righthand	76



Logitech MouseMan Serial \$65

Logitech's MouseMan is the next step in mouse technology. Specifically designed for right or left hand versions, it provides maximum comfort and 400 DPI hardware resolution. Includes MouseWare utilities and 1 lifetime warranty. Specify right or left for PaintShow add \$5.

Logitech Mouseman Cordless	129
Logitech Trackman Serial	75
Microsoft Serial or Bus Mouse only	83
Microsoft Serial or Bus w/ paint	95
Microsoft with Windows 3.0	147
Z-Nix Serial Mouse w/Windows 3.0	89

PROGRAMMING

Macro Assembler	95
Microsoft C Compiler	303
Borland C++	249
Borland ObjectVision for Windows	89
Turbo Pascal Dos/Windows	90 159
Quick Basic	60
Quick C or Quick Pascal	60
Visual Basic for Windows	125
Windows Developer's Kit	309

SPREADSHEETS

Allways	115
Excel for Windows	299
Lotus 1-2-3 version 2.2	325
Lotus 1-2-3 version 3.1	399
Lucid 3-D	53
Quattro Pro 3.0 Upgrade	119
Supercalc 5.0	89

Lotus 1-2-3 2.3 \$325

The powerful spreadsheet that runs on any PC. New WYSIWYG display, mouse support, 500 copy pages, direct connection to other graphics hardware, and more. Spreadsheet Publisher, Pivot Tables, and more add-on capabilities. Print preview, redaction, Cut as a link, information too.

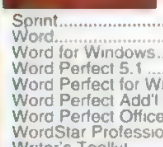


WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	55
LetterPerfect	119
Multimate 4.0	267
Professional Write	159
Publisher's PowerPak / WordPerfect	call
Rightwriter	55

WordPerfect 5.1 \$239

WordPerfect is the #1 rated word processor software. Its features are very feature-rich and yet it is easy to use. The current version add pull-down menus, mouse support, table creation, and equation editor. Add this to the best software support in the business and you can't go wrong.



Sprint	117
Word	209
Word for Windows	209
Word Perfect 5.1	239
Word Perfect for Windows	269
Word Perfect Add'l Station	153
Word Perfect Office	89
WordStar Professional	Call
Writer's Toolkit	79

WINDOWS SOFTWARE

Adobe Illustrator	279
Adobe Type Manager	59
Adobe Type Manager Plus Pack	115
After Dark for Windows	25
Ami	115
Ami Professional	287
Asymetrix Toolbook	279
Bitstream Facelift	57
Corel Draw 2.0	359
DBase/Windows	239

Microsoft Office \$447

This special bundle includes the leading Windows applications, Excel, Word and PowerPoint all in one. Excel is the top rated graphical spreadsheet. Word is the best Windows word processor and PowerPoint is the top presentation package. Act now and you will save half the cost if purchased separately.



Excel	299
Form Publisher	139
Grammatik IV for Windows	55
HDC First Apps or Windows Express	46
Micrographix Draw +	149
Micrographix Designer	449
MicroPhone II	199
Microsoft Mouse w/Windows 3.0	147
Microsoft Office Word Excel/Powerpoint	447
Microsoft Productivity Pack	339
Microsoft Windows Developer's Kit	309
Pagemaker 4.0	489
Per Form Pro	109
PFS WindowWorks	109
Powerpoint for Windows	309
Project for Windows	429
Publisher's Powerpak for Windows	45
Windows 3.0	89
Windows Entertainment Pack	27
Word for Windows	299

Excel 3.0 for Windows \$299

The best graphical spreadsheet now includes Toolba which puts frequently used commands at a single mouse click away. New Q & E lets you access remote databases. A Best Font menu intelligently chooses optimal font display without redrawing. A built-in flip art support and button macros are included too! Command level on-screen help for transitional 1-2-3 users is included too!



ENTERTAINMENT

Bannermania	21
Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
Hunt for Red October	19
King's Quest 5 (VGA Vers)	38
Leisure Suit Larry II or III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
PC Globe or PC USA	35
Simcity	28
SimEarth	39
Ultima VI: The False Prophet	39
Win Commander I / II	39 45

Utility Software

Address Book Plus	45
Calendar Creator Plus	39
Central Point Backup	57
Checkit	79

MS-DOS 5.0 \$55

All new and hot, hot hot! The new Microsoft DOS 5.0 fixes 48K or more for DOS or 286 & 386 PCs. Includes a new Shell Underlay and Uniform new Editor and more. Also includes Qbasic Comp and more.

Time Help new Backup and Windows enhancements. Plus you can install it on your drive without reformatting, even on Networks. The official upgrade pack requires that you simply have an older command.com on your drive. That's it!	
Company Ladder	45
Control Room	69
CoreFast	60
Carbon Copy Plus w/Host	105
Desqview	75
Desqview 386	125
Direct Access	57
Disk Manager Dos / Novell	36 95
Disk Optimizer	37
DR DOS 5.0	Call
GoScript 3.0	89
Fastback Plus	109

Stacker \$69

Stacker doubles the capacity of your hard disk in minutes, without reformatting. It compresses files in the background transparently giving you the extra room you need for higher performance. Stacker software with coprocessor card (\$139) is an easily installable hardware solution which gives your hard disk a new lease on life.

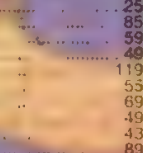
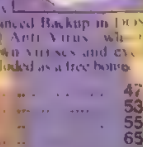


Headroom	59
InfoSpotter	45
Labels Unlimited	45
Laplinsk III	85
Mace Utilities 1990	88
Mace Vaccine	59
Microsoft Learning DOS	32
MS-DOS 5.0	55
Norton AntiVirus	79
Norton Backup	90
Norton Commander	90
Norton Utilities 5.0	109
PC Anywhere IV	95
PC Tools Deluxe 7.0	99
Personal Lawyer	34
P.D. Queue	55

PC Tools \$99 Deluxe 7.0

New PC Tools 7.0 is the perfect set of utilities for DOS 5. It includes new application menu system, remote operation of another PC, advanced data recovery and more. Includes an enhanced Backup in DOS and Windows version. Anti Virus which recognizes over 400 known viruses and even detects unknown ones is included as a free bonus.

PFS:Preface	47
Pop Drop Plus	53
PrintRite	55
ProComm Plus	65
Prodigy	25
QA Plus	85
QEMM 386	59
QRAM	48
SideKick Plus	119
Sideways	55
Smartcom Exec	69
Software Carousel	49
Super PC Kwik	43
XTree Gold 2.0	89



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Visa/MC# _____

Type of PC _____



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Features: • 80386SX 20 MHz Processor
• VGA Display • 8.5" x 11" x 1.8" • Internal
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CDW Price
\$849.46

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20 MB... **\$2598.10** 40 MB... **\$3078.49**
30 MB... **\$2839.31** 80 MB... **\$3399.67**

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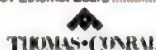
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NOVELL

ETHERNET Interface Connector (NE1000)... **\$148.44**
ETHERNET For PS/2 (NE2)... **\$51.72**
ETHERNET Board (NE2000)... **174.68**
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3Com

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3COM 3C507 Ethernet Card... **294.37**
3COM 3C503 Etherlink... **199.70**
3COM 3C503 Ethernet Plus... **583.81**
3COM 3C503 MCA Ethernet... **280.48**
3COM Ethernet Repeater... **848.31**
3COM 3C501 Ethernet Board... **332.73**



6142 Arcnet 8-Bit... **\$93.09**
6045 Arcnet 16-Bit... **205.23**
6142 TP-Arcnet... **103.83**
6046 PS/2 Board Arcnet... **228.16**
6150-10 8 Port Smart Hub... **509.65**
6150-11 16 Port Smart Hub... **691.01**
6045 Twisted Pair Plus Ethernet... **229.07**
6046 Twisted Pair Plus Ethernet... **245.11**
4045 16-Port Token Ring XT/AT... **510.23**

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3508TP Concentrator BNC... **897.73**
3508TP Concentrator TP... **727.27**
Active Hub 8 Port Twisted Pair... **365.91**

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3016 TP 10 Base T 16-Bit Ethernet... **218.92**
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PC 500WS Coax Arcnet Workstation 16-Bit... **169.41**
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Eisa 3200 Arcnet Coax... **718.10**

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WD MCA PS/2 10 Base T Ethernet... **224.42**
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WD Elite 16-Bit Ethernet Plus Coax... **173.84**
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XIRCOM

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Ethernet Pocket Adaptor 10 Base T... **373.86**
Parallel Port Multi... **75.00**

ARTISOFT

E143 Ethernet Adaptor Kit... **\$211.18**
LANtastic Ethernet Starter Kit... **477.27**
LANtastic 2Mbps Starter Kit... **339.53**
LANtastic 2Mbps Adaptor... **140.59**

DCA

IPMA Trac T.R. Convertible... **\$530**

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WordPerfect
CORPORATION

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BORLAND Quattro Pro Network Node... **193.18**
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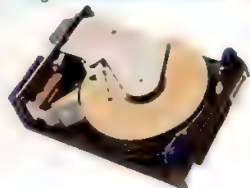
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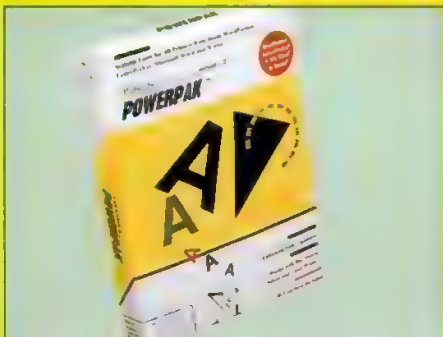
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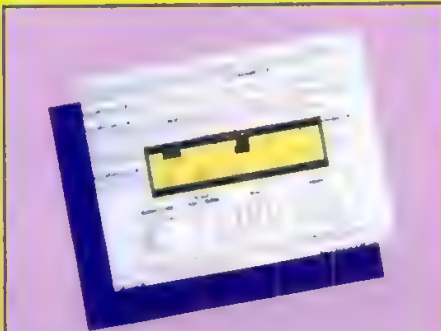
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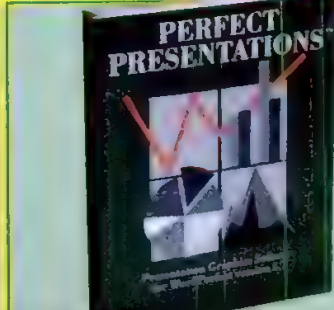
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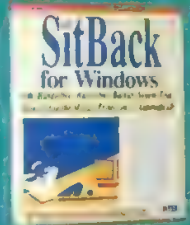
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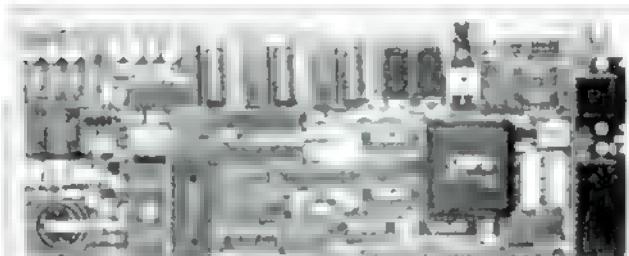
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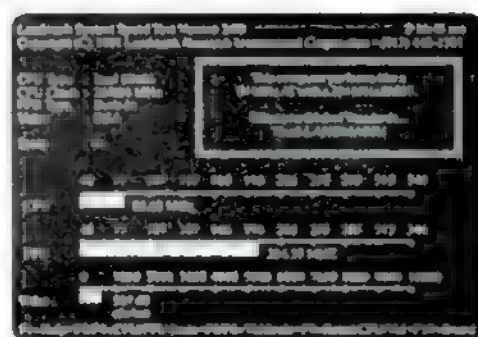
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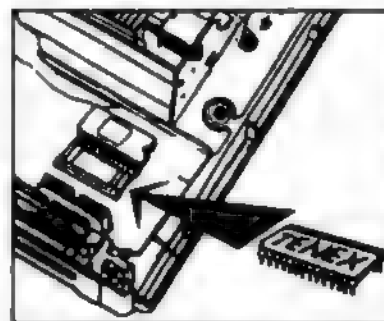
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AVOIDING VOLTAGE DROPS IN A HOME OFFICE

After reviewing your recent feature on power directors ("Power Directors: Convenience Plus Protection," January 29, 1991), I purchased a Kensington Master-Piece Plus unit. Shortly afterward, the low-voltage alarm light and buzzer were coming on and off sporadically.

Using a voltmeter, I soon noted that the line voltage would periodically drop down to 102–103 volts. After having the house wiring checked out and repaired, I thought I had cured the problem. However, I was still experiencing some voltage drops, but only down to 112–114 volts. Further checking revealed that my HP LaserJet II printer and Cannon PC-7 copier were causing the voltage to fluctuate from 119–120 volts down to about 113 volts. Either unit or both will cause such voltage drops with uncanny regularity; everything is fine with them turned off.

What is the cause of these periodic voltage drops? If I were to get a UPS (uninterruptible power supply), would this pose a problem, or should I simply not connect the LaserJet II to the UPS?

Jean Burrell
Larchmont, New York



It sounds as if your power director has identified a potential source of trouble. A UPS could save you from any data loss, but it won't really correct the underlying problem.

Periodic voltage drops are a common problem with laser printers and other devices that use similar types of printing engines, such as copiers and laser-fax machines, especially when you try to use them in a residential setting. The effect is similar to what happens when a refrigerator comes on in a circuit with a heavy

- **AVOIDING VOLTAGE DROPS IN A HOME OFFICE:** How to keep a printer, a copier, and a PC working in the same room.
- **WHEN HIGH MEMORY IS OUT OF REACH:** How to give *Windows 3.0* more RAM on a 386 system.
- **ALTERNATE LAYOUTS:** Where to find a Dvorak-type keyboard.

load, dimming lights on that circuit.

One reason that the line voltage drops is that the printer draws extra power in order to rotate the printing drum every 5 to 10 minutes, to prevent a build-up of ink powder on one side.

Another reason is that the printer has to keep the heating elements (which are used to fix the impression on the paper) at a high temperature, and periodically it draws extra power to get them up to operating temperature. This usually happens when the printer is sitting idle for long periods; this is also the reason your copier, which also needs to keep the print element hot, causes voltage drops.

Although it's normal for the laser printer and copier to cause a sudden power draw, the fact that they're causing a low-voltage situation is a cause for concern in a home.

Modern offices tend to have an electrical system designed to provide ample amperage for copiers and computers. Most homes have electrical service that wasn't designed to power today's typical office setup.

The first step toward solving the problem is to attempt to put the printer and copier on a different electrical circuit from the computer. I've found that the best way to handle this is to have one cir-

cuit that is dedicated to the computer, with no other peripherals or appliances on it. This protects the computer and peripherals from any voltage drops that might be caused by other electrical devices in the house.

The printer and copier should be able to coexist on a standard 15-amp circuit, but no other appliances should be on the circuit. Both draw about 7 amps at their peak.

Better still would be a 20-amp circuit, if one is available in your home office. It would still not supply enough power to run all three components adequately, but it would be better than a 15-amp line for two of three devices.

If your home office doesn't have enough circuits to allow you to dedicate separate lines, you need to consider how important it is to have both the copier and laser printer running. If this is a high priority, consider bringing more power into the house. An electrician in the New York area will charge about \$2,500 to add two 20-amp circuits to your existing wiring, including an upgrade to your master panel; the electrician deals directly with the power company, so the procedure is not as complicated as you might think.

A UPS would be a temporary fix, insuring against data loss and

protecting your computer from sudden power outages that will occur if your laser printer and copier recycle at the same time someone turns on a TV elsewhere in the house.

If you do get one, it's important that you get a UPS that protects against voltage drops as well as voltage spikes. *PC Magazine* published a comparative review of UPSs in the November 27, 1990, issue; though geared toward LAN servers, the review has a useful discussion of the ins and outs of purchasing a UPS, along with information on various makes and models.

Testing of a wide variety of surge suppressors will take place at PC Magazine Labs later this year. A formal review is scheduled to appear in December.

WHEN HIGH MEMORY IS OUT OF REACH

I bought a 20-MHz 386 computer in October of 1988. The computer has a System Micro 386 motherboard with 4MB of RAM installed.

The problem I have been unable to solve is how to access high memory (640K to 1MB). I recently purchased *Windows 3.0*, and the only way I could get it to run was to add the statement

EMMEXCLUDE=A000-EFFF

to the *SYSTEM.INI* file.

Without this statement it will not load in 386 Enhanced mode. The result is that I do not have enough conventional memory to run some of my DOS applications.

I have thought about purchasing *QEMM 5.1*, but do not want to spend more money on a program that may not work on my system. Also, I would hate to have to purchase a new motherboard to solve the problem, but from what I have been able to find out, this is my only alternative. Would *QEMM* be able to get around the limita-

Advisor

tions of this motherboard and allow me to move TSRs and other overhead to high memory, or am I stuck with shelling out several hundred dollars for a new motherboard?

Albert C. Dremstedt
Honolulu, Hawaii



It sounds as if your system defaults to using shadow RAM. Many 386 systems have an option in their setup to remap the various slow system ROMs, such as the system BIOS and video BIOS, into faster RAM. This kind of "shadowing" increases system performance during BIOS calls, as the calls are now answered from fast RAM. Unfortunately, using shadow RAM reduces or eliminates access to the memory area that is located between 640K and 1MB.

The first thing to do is to check the system's manuals and see whether the shadowing can be disabled (usually through the system setup options). If it can, you should be able to remove or modify the "EMMEXCLUDE" statement to regain some of that high memory for *Windows*' use. Also, don't forget to include the HIMEM.SYS driver in your CONFIG.SYS; *Windows* uses the HIMEM (XMS) memory area to load parts of itself and free up low RAM.

You don't say which BIOS your system uses, but it's possible that a newer version will support turning off the shadowing if the one in your system doesn't. The two biggest vendors of 386 BIOS chips are Phoenix (Phoenix Tech-

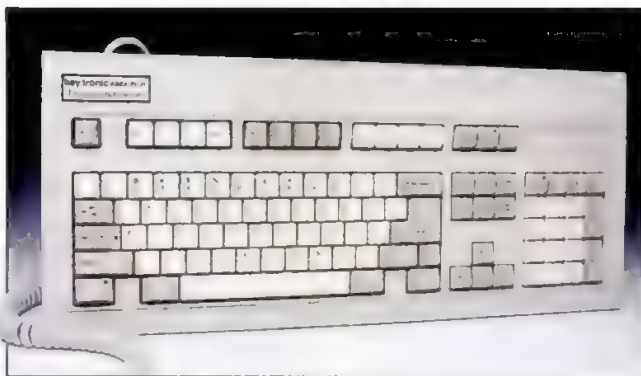
nologies Ltd., Norwood, Mass.; 800-344-7200, 617-551-4000) and AMI (American Megatrends, Norcross, Ga.; 800-828-9264, 404-263-8181). It's quite possible that one or both of these brands will be compatible with your system.

QEMM-386 (Quarterdeck Office Systems, Santa Monica, Calif.; 213-392-9851; \$100) and **386MAX** (Qualitas, Bethesda, Md.; 800-733-1377, 301-907-6700; \$130) are 386 memory managers. By using the built-in memory mapping capabilities of the 80386/80486 chips, these utilities provide "High DOS," backfilling the 640K to 1MB memory and allowing you to load TSRs and device drivers into this area.

Depending on the system, it's possible to gain as much as 170K of High DOS and have over 600K of available RAM at the DOS prompt. Both utilities support some of the systems that have built-in shadow RAM, recovering as much high memory as possible. Check with the vendors to see whether your system is supported.

On systems that don't have built-in shadowing, or where shadowing can be turned off, both **QEMM** and **386MAX** provide the same function, remapping the slower ROMs into fast RAM. They also provide access to the XMS memory area, eliminating the need for the HIMEM.SYS driver.

The latest versions of both utilities support *Windows* 3.0 in 386 Enhanced mode while they are loaded. Qualitas also makes a version of **386MAX** called **BlueMax**, which recovers more high memory on IBM PS/2 systems than **386MAX** can. It does this by



Both Key Tronic and Northgate sell a variety of keyboard layouts, including the Dvorak arrangement. Some people find this key arrangement to be easier to use.

compressing the BIOS area (in particular the BIOS, which is used only under OS/2) and remapping the compressed BIOS to provide as much High DOS as possible.

By the way, systems that use shadow RAM will have the same problem with DOS 5.0. You'll be able to load part of DOS into high memory, but you won't be able to fit other programs and device drivers up there. **QEMM** and **386MAX** solve this problem too, since they can either turn off the shadowing or work around it.

ALTERNATE LAYOUTS

I want to purchase an American Simplified Keyboard (Dvorak) that is IBM compatible. Can you direct me to a supplier?

Joseph E. Kapsos
Arlington, Texas



I found three suppliers of Dvorak-style keyboards (no relation to the *PC Magazine* columnist John C. Dvorak).

The **SureStroke** (Seasoned Systems, Chapel Hill, N.C.; 800-334-5531, 919-732-9391; \$99) is compatible with PC, PC-XT, and Compaq systems. Seasoned Systems also sells **SureStroke/Dvorak**, a \$95 software package that converts your existing PC keyboard into a Dvorak-style keyboard through a TSR that translates the keystrokes. Transfer letters are included for each key, and the package includes an on-line training program that teaches touch-typing on the Dvorak keyboard.

Key Tronic Corp. (Spokane, Wash.; 800-262-6006, 509-928-

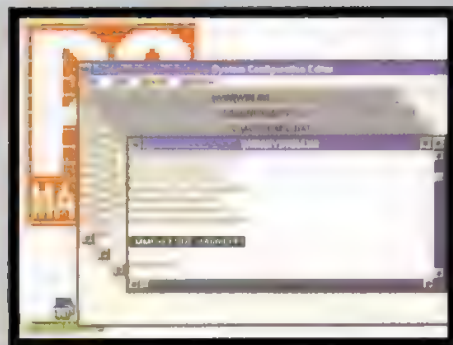
8000) makes the KB 101 Plus keyboard (\$149) in a Dvorak layout. The KB 101 Plus comes out of the box compatible with PC, XT, and AT systems, and a DIP switch selection offers compatibility with all PS/2s. The 12 function keys run across the top of the unit.

Northgate Computer Systems (Minneapolis, Minn.; 800-548-1993, 612-943-8181) has two keyboards that can be ordered in Dvorak versions. The **OmniKey Ultra** (\$149) can be used with PC, XT, and AT systems, and is unique in that it sports function keys both on the left side and across the top of the keyboard. The **OmniKey Plus** has the function keys on the left, and it can be used with PC, XT, AT, and PS/2 systems.

If you're not familiar with the Dvorak layout and want a way to try it first before investing in a brand new keyboard, you can purchase a keyboard macro program such as **Smartkey** (No Brainer Software, Midvale, Utah; 800-748-4499, 801-561-3834; \$50). **Smartkey** comes with a predefined macro that converts your existing keyboard to Dvorak. No transfer letters are included, though, so you have to make your own or change your keycaps around.

ASK THE ADVISOR

Send your questions to PC Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload them to PC MagNet (see the instructions for joining on page 8 of this issue). Sorry, but we cannot send personal replies. ■



Edit Win 3's **SYSTEM.INI** file to access unused memory. **SysEdit**, a *Windows* utility, allows easy editing of .INI files.

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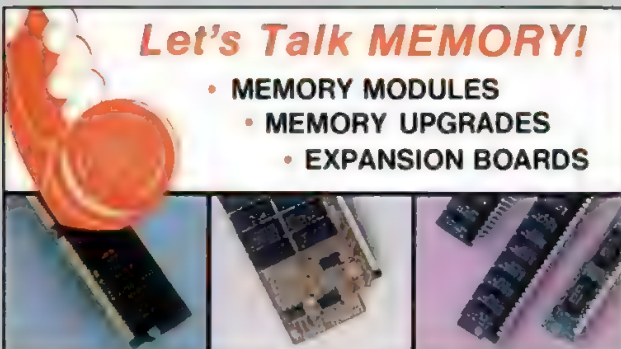
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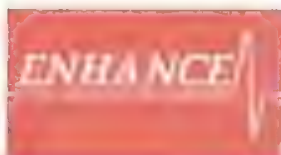
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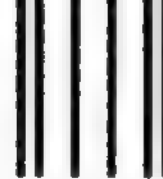
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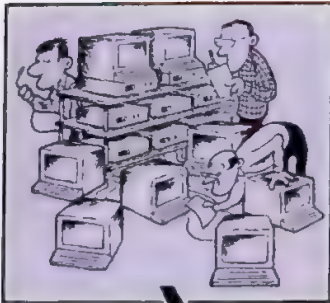
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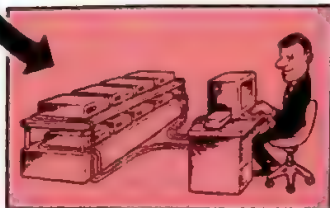


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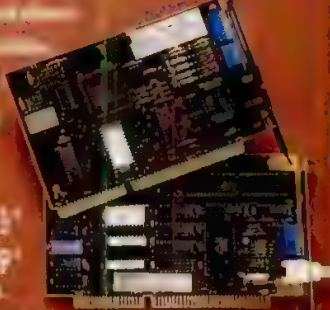
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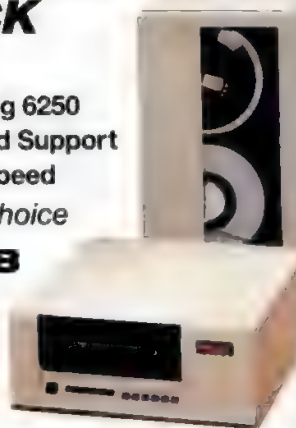
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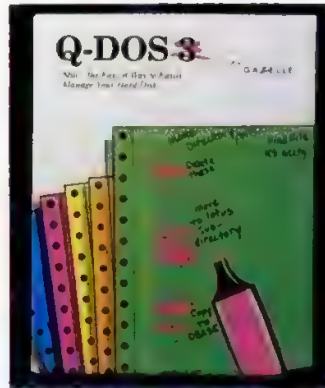
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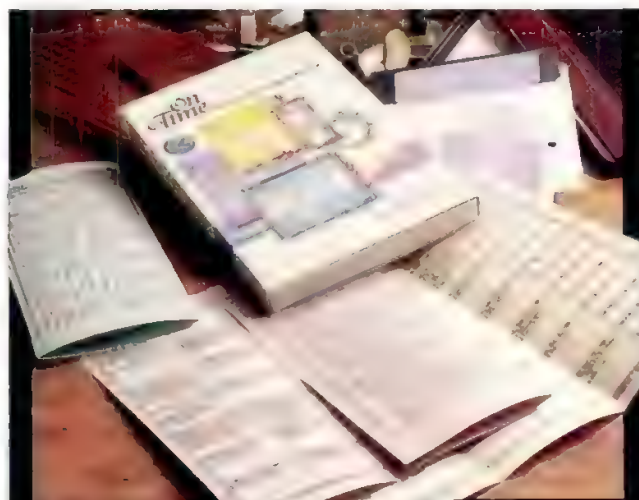
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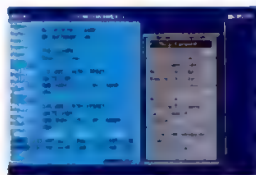
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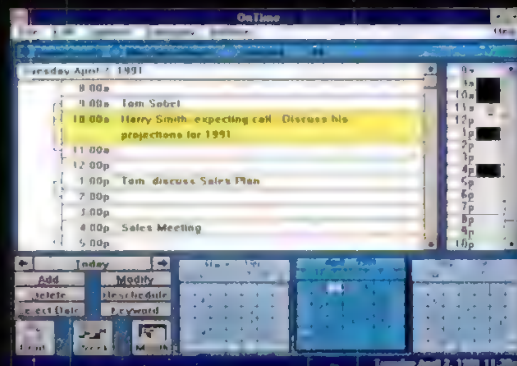
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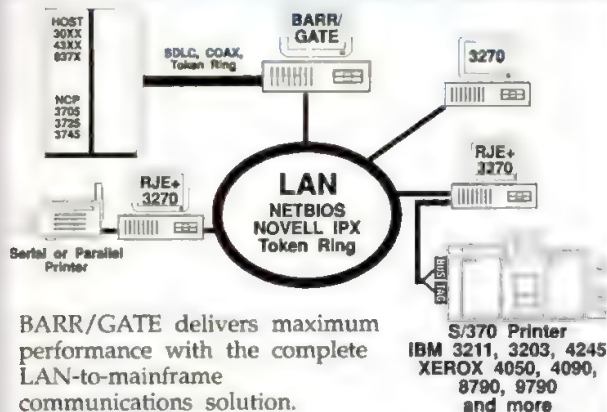
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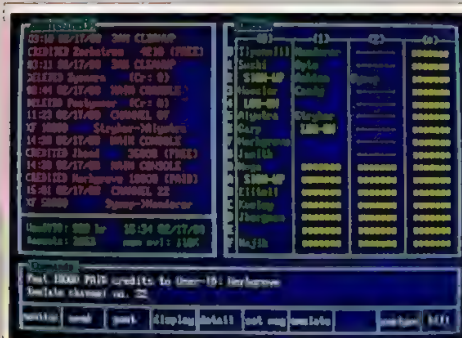
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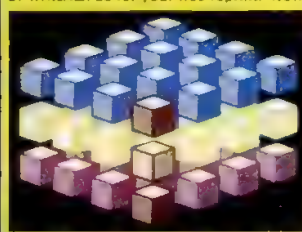
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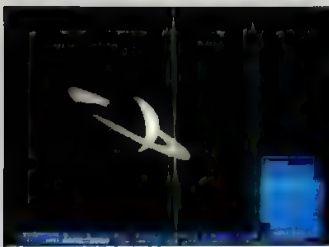
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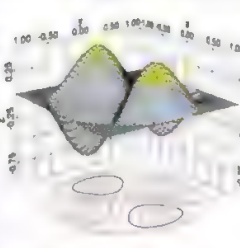
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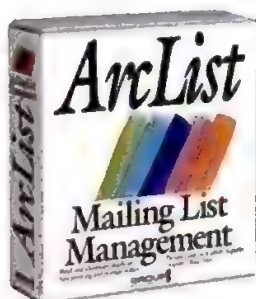
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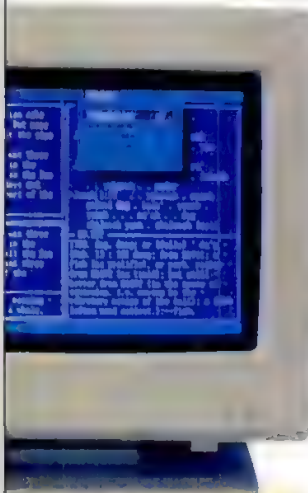
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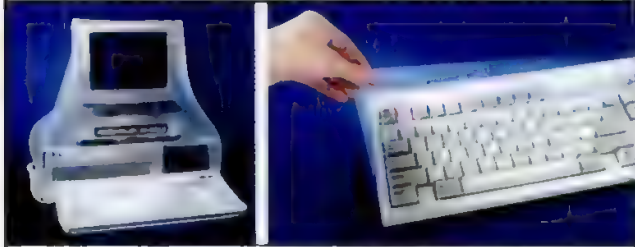
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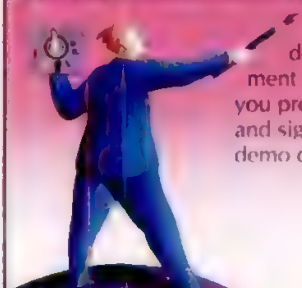
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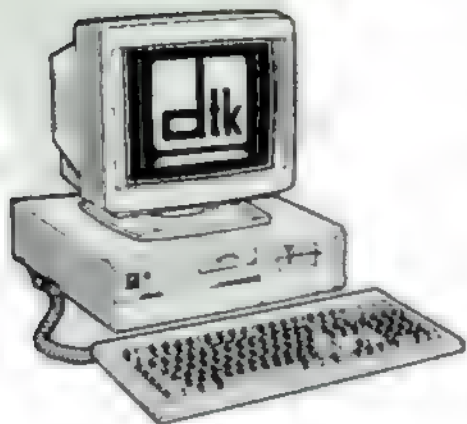
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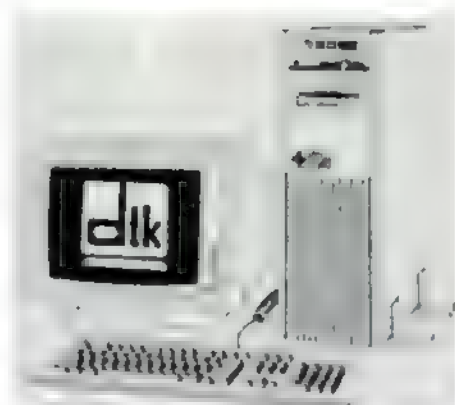
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TECH-1663	80286-16MHZ, Slimline, 1MB expandable to 5MB, 5.25" Disk included, 3.5" Disk optional, Super VGA Card 256K expandable to 1MB, Two 8 Bit slot plus Three 16 Bit Slots.	NONE Color VGA	\$575 \$874	\$799 \$1,058	\$929 \$1,208	n/a n/a	n/a n/a
PEER-1630	80386SX-16MHZ, Desktop, 1MB expandable to 5MB, 5.25" Disk, 3.5" Disk optional, Super VGA Card 256K expandable to 1MB, Three 8 Bit slots plus five 16 Bit Slots.	NONE Color VGA	\$780 \$1,059	\$998 \$1,277	\$1,148 \$1,427	n/a n/a	n/a n/a
PEER-1660	80386SX-16MHZ, Slimline, 1MB expandable to 5MB, 5.25" Disk, 3.5" Disk optional, Super VGA Card 256K expandable to 1MB, PS/2 mouse port, Two 8 Bit slot plus (3) 16 Bit Slots.	NONE Color VGA	\$748 \$1,027	\$967 \$1,246	\$1,118 \$1,397	n/a n/a	n/a n/a
PEER-2030	80386SX-20MHZ, Desktop, 1MB expandable to 5MB, 5.25" Disk, 3.5" Disk optional, Super VGA Card 256K expandable to 1MB, Three 8 Bit slots plus five 16 Bit Slots.	NONE Color VGA	\$836 \$1,115	\$1,056 \$1,335	\$1,206 \$1,485	n/a n/a	n/a n/a
KEEN-2530	80386-25MHZ, Desktop, 2MB expandable to 8MB, 5.25" Disk & 3.5" Disk included, Super VGA Card 256K expandable to 1MB, Two 8 Bit slot plus Five 16 Bit Slots plus one 32 Bit.	NONE Color VGA	\$1,145 \$1,424	\$1,368 \$1,647	\$1,518 \$1,797	\$1,637 \$1,916	n/a n/a
KEEN-3304	80386-33MHZ, Tower, 4MB expandable to 16MB, 5.25" Disk & 3.5" Disk included, Super VGA Card 256K expandable to 1MB, One 8 Bit slot plus six 16 Bit Slots plus one 32 Bit.	NONE Color VGA	\$1,529 \$1,808	n/a n/a	\$1,875 \$2,154	\$1,994 \$2,273	\$2,255 \$2,534
FEAT-2502	80486-25MHZ, Tower, 8MB, 5.25" Disk and 3.5" Disk included, Super VGA Card 256K expandable to 1MB, One 8 Bit slot plus six 16 Bit Slots plus one 32 Bit.	NONE Color VGA	\$2,333 \$2,612	n/a n/a	n/a n/a	\$2,799 \$3,078	\$3,065 \$3,344
FEAT-3301	80486-33MHZ, Tower, 8 MB, 5.25" Disk and 3.5" Disk included, Super VGA Card 256K expandable to 1MB, One 8 Bit slot plus six 16 Bit Slots plus one 32 Bit.	NONE Color VGA	\$2,736 \$3,015	n/a n/a	n/a n/a	\$3,208 \$3,487	\$3,446 \$3,725
FEAT-3302	80486-33MHZ, Desktop, 8MB, 5.25" Disk and 3.5" Disk included, Super VGA Card 256K expandable to 1MB, One 8 Bit slot plus six 16 Bit Slots plus one 32 Bit.	NONE Color VGA	\$2,855 \$3,134	n/a n/a	n/a n/a	\$3,327 \$3,606	\$3,565 \$3,844

All above systems include a 101 KeyBoard, Two Serial ports, One Parallel port and One game port. The 5.25" floppy disk drives are all 1.2MB. The 3.5" floppy disk drives are all 1.44MB. Where we show a PS/2 Mouse port no game port is included.

*To substitute a 14" Color Super VGA 1024 X 768, .28 Dot Pitch with Tilt and swivel for the color VGA add to VGA price..\$99. For a 12" Mono VGA, add to NONE price\$124.



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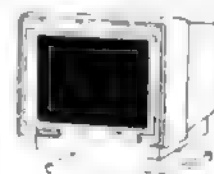
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Source: Beta Research Study, 1988
*BPA Audit December, 1990

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Source: Beta Research Study, 1988 *BPA Audit December, 1990

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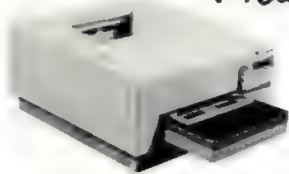
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8087 675	8087 695
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8087 685	8087 705
8087 690	8087 710
8087 695	8087 715
8087 700	8087 720
8087 705	8087 725
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8087 730	8087 750
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8087 745	8087 765
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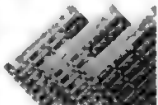
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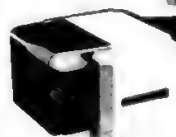
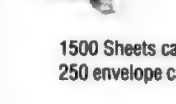
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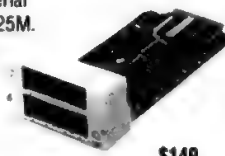
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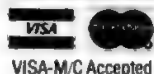
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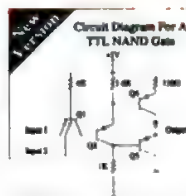
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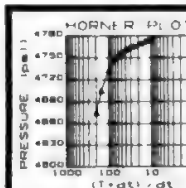
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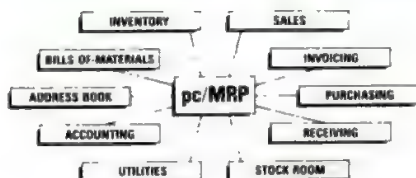
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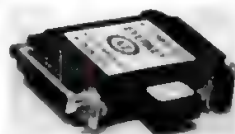
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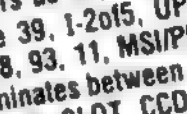
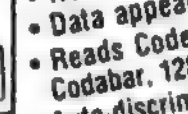
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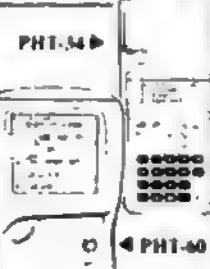


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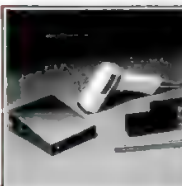
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COMING UP

SPECIAL ISSUE: LAN-TO-LAN CONNECTIVITY

PC Magazine goes one step beyond local area networking to provide an in-depth focus on the myriad ways in which you can bridge the gaps among your organization's diverse and widespread LANs.

BRIDGES AND ROUTERS

The heart of LAN-to-LAN connectivity, bridges and routers that fit inside a PC provide organizations with the ability to link LAN segments across long-distance lines. More important, they do so intelligently, keeping nonessential traffic from clogging long-distance circuits.

CONNECTION ALTERNATIVES

Finding, selecting, and installing the communications links between LAN segments is a challenging proposition. We provide valuable advice on choices ranging from transport mechanisms such as public dial networks and leased lines to FDDI and ISDN.

PUBLIC DATA NETWORKS

Public data networks like Sprintnet and Tymnet carry high-speed data reliably between multiple locations. But the hot new frame-relay technology threatens services supporting long-established X.25 protocols. Our reviewers describe the features of the services and their solutions to a LAN-to-LAN connection scenario.

ASYNCHRONOUS COMMUNICATIONS SERVERS

Access servers bring the power of your network to users in other locations by allowing external PCs (or communications servers on other LAN segments) to dial in and access the facilities of the host LAN segment.

BBS SOFTWARE

These packages, which provide support for BBS-based networks like Fidonet, give organizations a means to connect their farflung employees via their own private BBSs.

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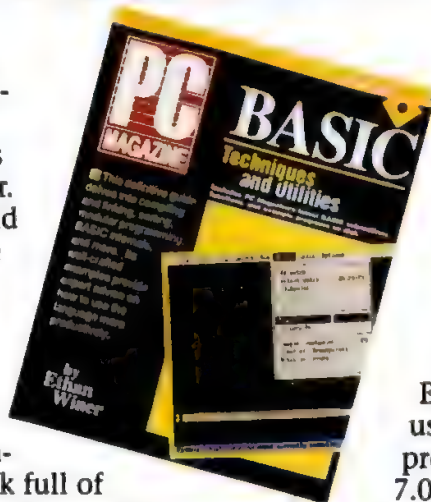
Take the Language to the Limit

Two New Information-Packed Sourcebooks with On-Disk Tools from PC Magazine.

PC Magazine *BASIC Techniques and Utilities* gives you the definitive guide to programming in BASIC, written by PC Magazine's contributing editor Ethan Winer. Winer provides useful, real-world advice as well as tips to increase programming productivity.

On-Disk, Ready-to-Use Utilities and Examples

In addition to Winer's information-packed guide, you get a disk full of useful subroutines, functions, and examples. Included are DOS and BIOS service utilities, input and menu routines, windowing and video routines, and a complete terminal program with phone dialer.



PC MAGAZINE **BASIC** Techniques and Utilities

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Ethan Winer has written the most useful book available on BASIC, providing helpful insights on BASIC 7.0, 7.1, and QuickBASIC. He starts with the essentials and carries the user through modular programming, compiling and linking, memory management, accessing DOS and BIOS services, and a host of other informative topics.

The Book on BASIC

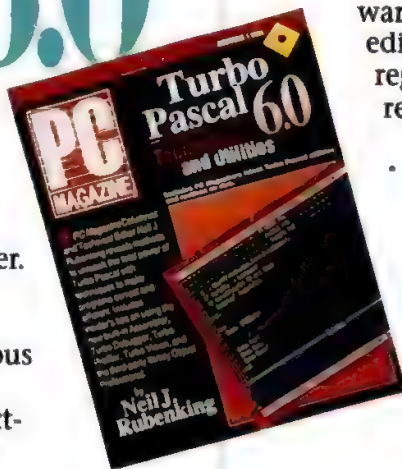
A well-respected authority on compiled BASIC, Winer is the author of the QuickPak Professional and PDQ software packages. As a contributing editor to PC Magazine, he writes regularly on programming-related subjects.

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After Hours

Products for the Leisure Side of Personal Computing

CD-ROM-Based Mother Goose Offers Characters That Actually Speak

EDUCATION
by Don Trivette

Sierra On-Line's *Mixed-Up Mother Goose* made her debut three years ago and has been a smash hit with the early-reader crowd ever since. The new version, delivered on a shiny compact disk, is quite different from any computer game you've seen. This is the first all-talking adventure—the first multimedia CD-ROM game designed for the mass market. The talkies have arrived!

As you wander around the 3-D, 256-color Mother-Goose land, you encounter various nursery-rhyme characters who

have lost something. See the little girl standing by the fence? Click on the lips icon and you'll hear the following conversation.

Little Bo-Peep: "Here, sheep! Where are you, sheep?"

You: "Have you lost your sheep?"

Peep: "Yes, and I don't know where to find them."

You: "I'll help you find them."

Peep: "You must be that nice child I heard about from Mother Goose."

It's up to you to find Bo-Peep's sheep. On the way, you'll encounter lots of other lost objects, including Old King Cole's pipe, Jack Sprat's fat, Humpty-Dumpty's ladder, Jack and Jill's pail,

and Miss Muffet's tuffet.

Eventually you'll come across the bleating sheep. Click on them, and they'll follow you back to Miss Peep. She's so delighted, she says, "My sheep! And look at those tails wagging. Thank you so much for finding them." Whereupon she bursts into the nursery rhyme that made her famous. Yes, this is also the first software with choral accompaniment.

"Little Bo-Peep has lost her sheep,

And doesn't know where to find them.

Leave them alone and they'll come home,

Wagging their tails behind them."

If this sounds a little tame compared with the usual fare of slaying dragons and foiling space monsters, I can tell you that adults love it almost as much as little children.

Most of the voices are those of Sierra employees, and it sounds like they had a wonderful time doing them. Bo-Peep is played by Roberta Williams, the cofounder of Sierra and designer of *Mother Goose*; Roberta also speaks the part of Mary Quite Contrary. If the old woman who lives in a shoe sounds a little odd, it's because she is performed by Mr. Chris Iden, the head of programming. As you work through the game, you will hear southern, New England, and German accents, to name just a few.

Mother Goose is totally icon-based. Once you type the DOS command to load the program, you no longer need the keyboard. A joystick can be used to move about and select icons, but a mouse is preferred. There's also nothing to read; all instructions are spoken, so this is a game that prereaders will be

EDUCATION

Sierra's new *Mixed-Up Mother Goose* talks as it teaches.

GAMES

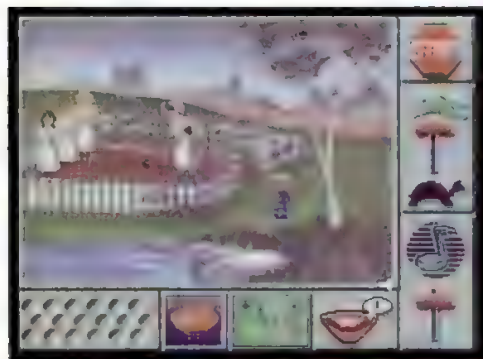
Wonderland tucks a challenging text adventure behind a new interface.

Nemesis Go

Junior gently introduces novice players to the game of Go.

LANGUAGE

Babbie! makes humorous hash out of text files.



Roberta Williams, creator of some of Sierra's best-known games, is the voice of Mary Quite Contrary and Little Bo-Peep.

The Old Woman Who Lived In A Shoe is one of the talking characters in the CD-ROM version of *Mixed-Up Mother Goose*.



able to play on their own.

Because the standards for multimedia products are still vague, Sierra includes two CD-ROMs in the package. The red-labeled disk is for users who have a CD-ROM player with audio capabilities. For users with older CD-ROM drives that do not have sound capabilities, the blue-labeled version is the disk to use. Sound and voices on the blue disk are digitized and require a sound card that can reproduce speech like the Sound Blaster or Disney's Sound Source.

As you would expect, the CD audio on the red label is superior to the digitized version, but the digitized version does have one added feature. Because digitized speech takes less room on the disk, Sierra was able to put four foreign language versions on the blue disk. Jack Be Nimble and his fellow Goosers speak in French, German, Spanish, and

CONTINUES

After Hours

Mother Goose

CONTINUED

Japanese as well as English. If you are a multilingual family, this might turn out to be a real bonus. The foreign voices were done by professionals, not Sierra employees.

Given the relatively slow performance of CD-ROM drives, you might expect scene changes to be slow, but they are not. Indeed, *MG* plays as fast and as smoothly as hard disk-based games like *King's Quest V*. Although a few small files can be installed on the hard disk, the program, sound, and graphics files remain on the compact disk.

As with any cutting-edge technology, there are a few glitches. Sometimes the game loses its voice if I've played

another game first, so I have learned to always reboot before I play *Mother Goose*.

There's not much to fault with the multimedia version of *Mixed-Up Mother Goose*. Even the price is right; it lists for \$59.95, the same as the floppy disk version. Sierra is doing what it can to make multimedia affordable. It's too bad the CD-ROM drive manufacturers haven't been able to do the same. If more families could afford the hardware, this game would be the Snow White of the computer generation.

List Price: *Mixed-Up Mother Goose*, \$59.95. **Requires:** 286-based PC or better, 640K RAM, VGA or MCGA graphics, CD-ROM drive, DOS 3.3 or later, Microsoft 2.1 CD-ROM extensions; mouse strongly recommended. Sierra On-Line, P.O. Box 485, Coarsegold, CA 93614; 800-326-6654.

CIRCLE 418 ON READER SERVICE CARD

You Are Alice in Virgin Mastertronic's PC Version Of Carroll's Wonderland

GAMES
by Cristina Córdova

Virgin Mastertronic's *Wonderland*, an adventure game based on Lewis Carroll's classic tale, isn't merely an opportunity to run around eating mushrooms, talking to tiny dormice, and using hedgehogs as croquet balls. While it does re-create the imaginative whimsy of Carroll's stories, it also integrates text and graphics behind an extremely innovative interface. *Wonderland* combines the richness of old-style text-based games like *Adventure* with the vivid, high-resolution images to which PC gamers have become addicted.

Wonderland was created by Magnetic Scrolls, developer of *The Pawn* and *Guild of Thieves*. It incorporates the Magnetic Scrolls parser and an entirely new graphical interface with multiple windows, pull-down menus, icons, on-line help, dynamic mapping, and even the ability to enter command lines without typing a word.

Cast as Alice, you explore

the vast domains of *Wonderland*. All the familiar characters appear in their expected surroundings; the Mad Hatter and the March Hare hold their tea party, and the giant caterpillar perches upon his mushroom, dreamily puffing away on his hookah. As you progress, you must solve a series of puzzles. How do you draw treacle from a treacle well? And how can you place a flamingo's egg in a pigeon's tree top nest?

Some of the problems you encounter present quite a challenge. Shrinking and growing are complicated, for example, and you may find yourself stuck in a room if you can't shrink yourself enough to fit through the door. If you don't do things in the proper order, you often have to go back to the beginning and start from scratch.

As with most text-based adventures, it's very important to save continually. Even conscientious saving won't prevent your having to start over a few

times. You may be far along in the game and suddenly realize that you previously used a needed object, for instance.

Of course, it helps to have read Lewis Carroll's book, so you have some idea of what awaits you and what not to do or say around certain people. It helps, for example, to know that the Queen of Hearts is not fond of white roses, so that you can help the gardeners paint the roses before she has you beheaded.

The focal point of the game is the Session window, where lucid descriptions of the surrounding area appear. This part of the game most resembles traditional text-based adventures. Everything that happens is in some way reflected in this window. You can type commands directly into the Session window or, to avoid typing at all, you can make selections from pull-down menus that contain verb and object options.

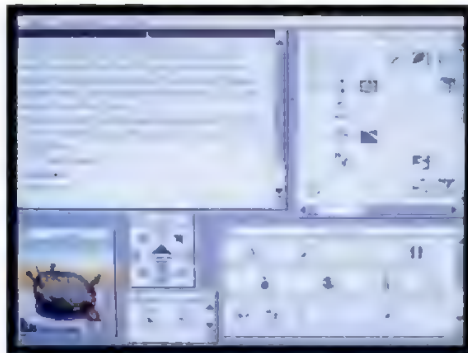
The Graphics window displays a VGA-mode illustration relevant to your current location in the game. Many of the graphics are animated or contain objects that you can click on to learn more about them. The Graphics window can also depict remote locations, which you

select by clicking on points within the Map window.

You can navigate around the game without typing, also by clicking within the Map window. So as not to reveal any deep secrets, the map shows only locations that you have explored. Unfortunately, when you use this window to move from one location to another, it flips through all the in-between locations. As it does this, it shows each graphic and prints every accompanying description in the session window. This can be especially annoying—not to mention time-consuming—if you have the game set on "verbose" mode.

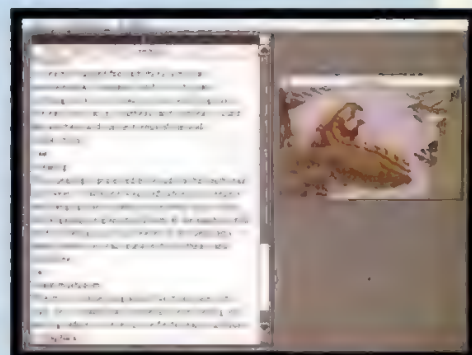
Another way of traveling is through the Compass window. By clicking on the appropriate point of the compass, you can move to any neighboring room. Choosing a direction in the Compass window has the same effect as typing in that direction: The same text appears in the Session window.

An Inventory window shows objects in your possession, while the Items in Room window shows objects that are visible in the current location, but not in your possession. Concealed objects do not appear in this window; you have to open a drawer for the items inside of



Wonderland's ground-breaking interface uses multiple windows to integrate the best of text-based and graphics-based games.

The graphics images in *Wonderland* include pictures of familiar characters such as the hookah-smoking caterpillar.



After Hours

Wonderland

CONTINUED

it to appear in the Items in Room window. Double-clicking on an object icon brings up a short description of that object. Dragging an icon between the two windows drops or gets the item it represents; instead of typing "get bottle" you just click on the relevant icon and drag it into your inventory window.

A sophisticated memory manager actively controls screen objects. Every now and then—while you're in the middle of a game—a window will mysteriously close or a dialog box will appear and ask you to close a window. It's an inconvenience, but it allows the game to make optimal use of your system resources. *Wonderland* remembers the status of closed windows and reopens them as soon as you close other windows.

Wonderland's hierarchical help system offers increasingly

significant hints about a given area of the game. The first hint is rather cryptic; selecting more hints makes your task easier. The game keeps track of the number of hints you consult, however, and that's reflected in your score.

Wonderland brings the best of text-based and graphics-based games to Alice and her adventures. The game offers the complexity and detail that only text games can provide, along with visuals that both communicate information and help you form mental images. The windowing

system simplifies navigation, mapping, and manipulation of objects. Just remember, it's a zany world in there. Animals are capable of rather rational observations, birds are easily fooled, and you can walk with your head in the clouds if you so desire.

List Price: *Wonderland*, \$59.99. **Requires:** 640K RAM, DOS 2.0 or later, graphics adapter. Virgin Mastertronic International Inc., 18001 Cowan, Suite A, Irvine, CA 92714; 714-833-8710.

CIRCLE 417 ON READER SERVICE CARD

Go Junior: A Simple Intro To a Highly Complex Game

GAMES
by Joanne Albrecht

The game of Go originated in China and was introduced to Japan in the fifth century A.D., where its popularity has grown ever since. Today, Go is Japan's national game.

The standard version of the game is played with black and white stones on a 19-by-19 grid. Each player positions stones on the grid so that they surround as many empty intersections as possible. The winner is the one who captures the most empty space on the board. Easy, right? Wrong. And that's why Go can become an addiction: Because it seems so easy. The fundamentals are as easy as checkers, but true mastery of the game is more complex than chess. Toyogo has come to the aid of befuddled beginners with *Nemesis Go Junior*, a simplified PC version of the game that teaches Go basics.

Go Junior (\$35) is designed to teach novices the rules and the most important elements of strategy. At the opening of the game you sketch out the territory you hope to enclose. In the midgame, you attempt to simultaneously defend your own territory from invasion and attack your opponent's territory. During the endgame, players haggle over remaining spaces until there are no profitable moves left for either party.

To play an effective game of Go, you must visualize the entire board as you plan your own

moves and try to anticipate your opponent's. The standard-sized board presents a daunting range of possibilities, so the programmers at Toyogo kindly provide a modest 9-by-9 grid, on which you can practice until you're ready to graduate to an intermediate 13-by-13 board. Once you have gained confidence at that higher level of complexity, you are finally ready to graduate to *Go Junior's* standard 19-by-19 board. A "Handicap" option allows you to start with an advantage of up to nine stones.

Nemesis is your computer-generated opponent. Her default ability level (and the strongest computer opposition you can face with *Go Junior*) is 13 kyu, a rating that represents a moderately good player. You can decrease her strength by selecting 20, 25, 30, or 35 kyu from the setup menu. (There's also a setting that will let you play against a human opponent.) The manual advises that you will learn the most by setting *Nemesis* to her strongest setting and choosing an appropriate handicap and/or using a smaller board size.

I found this to be entirely true; when I set *Nemesis* to 35 kyu and gave myself a seven-stone handicap, I beat the computer immediately. It took me a day or two, however, to beat her on the 9-by-9 board with only a two-stone handicap.

Several other menu options facilitate learning and understanding, and allow you to study the board when the game is over

Nemesis Go Junior simplifies the highly complex game of Go by starting novices on a small subset of the full board.

to see why you won or lost. There is a "grid labels" feature that labels the grid numerically along one edge and alphabetically along the other.

When you make a move, *Nemesis's* countermove is explained with a short tag line at the bottom of the screen: for instance, "Defend E07—edge link." When you ask *Nemesis* for a hint, the tag line may respond "Try C02—Defend D03 string." You then locate the C02 position on the grid and place your stone there, thus defending your D03 string. While the meaning of many of the tag lines is obvious or becomes self-explanatory as you play, there are a few unfortunate exceptions.

For instance, I received an "Endgame link attack" message as an explanation for *Nemesis's* move a number of times during the game, when things still appeared to be very open. Well, *Nemesis* made her move, I countered (in the dark as to whether I was fending off this ominous-sounding "Endgame" thing), and the game proceeded. Sometimes I won, sometimes I lost. I would have liked further details about what an "Endgame link attack" means, but the term isn't



explained in any of the documentation, and there's no online glossary.

Go Junior supports virtually all video configurations, since it requires no graphics support (ANSI.SYS is required on MDA systems). On CGA, EGA, or VGA systems, the game displays a simple, attractive representation of the playing board.

On the whole, *Go Junior* provides more than enough information, features, and options to keep you continuously challenged as you learn.

If you want to face a tougher adversary than *Nemesis* (and you won't, unless you're an experienced player or a genius), you'll have to upgrade to Toyogo's *Go Master* program. *Go Master* sells for \$79 and has optional tutorials that teach the finer points of the game. I'll tell you about it next year.

List Price: *Nemesis Go Junior*, \$35. **Requires:** 512K RAM, DOS 2.1. No graphics adapter required; ANSI.SYS required for text-mode operation. Toyogo Inc., 25460-M, Honolulu, HI 96825; 800-869-6469.

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by
Bill Howard

Abort, Retry, Fail?

The Lighter Side of Personal Computing

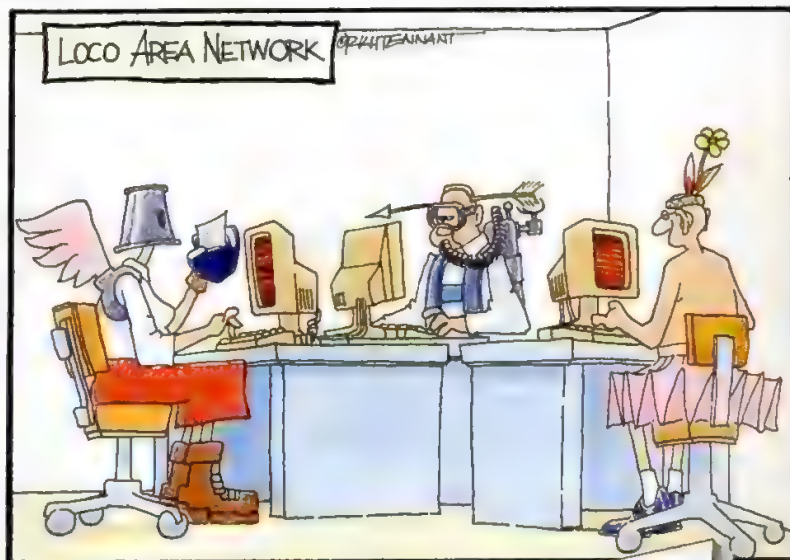
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Get a Life Dept.

We're starting to worry about our readers. One reader spends his spare time totaling the tiny columns of numbers in *Lotus 1-2-3* ads on the long-shot chance Lotus would let an ad go into print with totals that don't seem to add up. (Not such a long shot, as it turns out. See ARF, April 30, 1991). More recently, readers on PC MagNet argued long into the night over the accuracy of the cover artwork on the April 30 issue. The burning issue for those who could actually see through the translucent plastic: why the wires were sequenced differently on the RJ-11 connectors—blue-yellow-green-red-black-white on the green and blue cables, the opposite on the yellow cable (inset above). For the record, the green and blue cables are sequenced correctly.

If your entry is used in *Abort, Retry, Fail?* we'll send you \$50 and a *PC Magazine* T-shirt. In case of multiple entries, the postmark date, neatness, and completeness of entry are considered. Winners this issue: Robert Beck (AST Six Pack).

PC MAGAZINE

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One of the ads that made Compaq see red.

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Actually, the next week Compaq did get around to cutting its suggested list prices, by 8 to 34 percent. And then squeezed dealer margins. A typical dealer discount used to be 41 percent off list price; now it's more on the order of 30 percent, or 33 to 35 percent for a few very high-end Compaqs. Translation: Prices look a lot lower. They'll be a bit lower. Just make sure you're sitting down when you price Compaq accessories like the \$275 floppy disk drive.

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1. Which products are you most interested in?

- ☐ 286-based systems ☐ UNIX®-based systems
☐ 386-based systems ☐ Laptops/Notebooks
☐ 386SX-based systems ☐ Other: _____
☐ i486-based systems

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company? _____

7. Are you interested in leasing? ☐ Yes ☐ No

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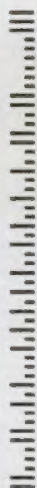
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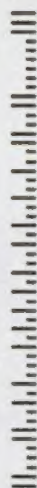
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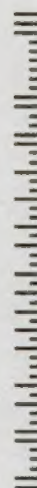
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